JUNE 1961

POWER TRANSMISSION DESIGN

INCLUDING BEARINGS DESIGN/APPLICATION

ALSO IN THIS ISSUE

Planetary gear trains—
when and where to use them

A look at antiskid brakes

Application tips
for split-needle bearings

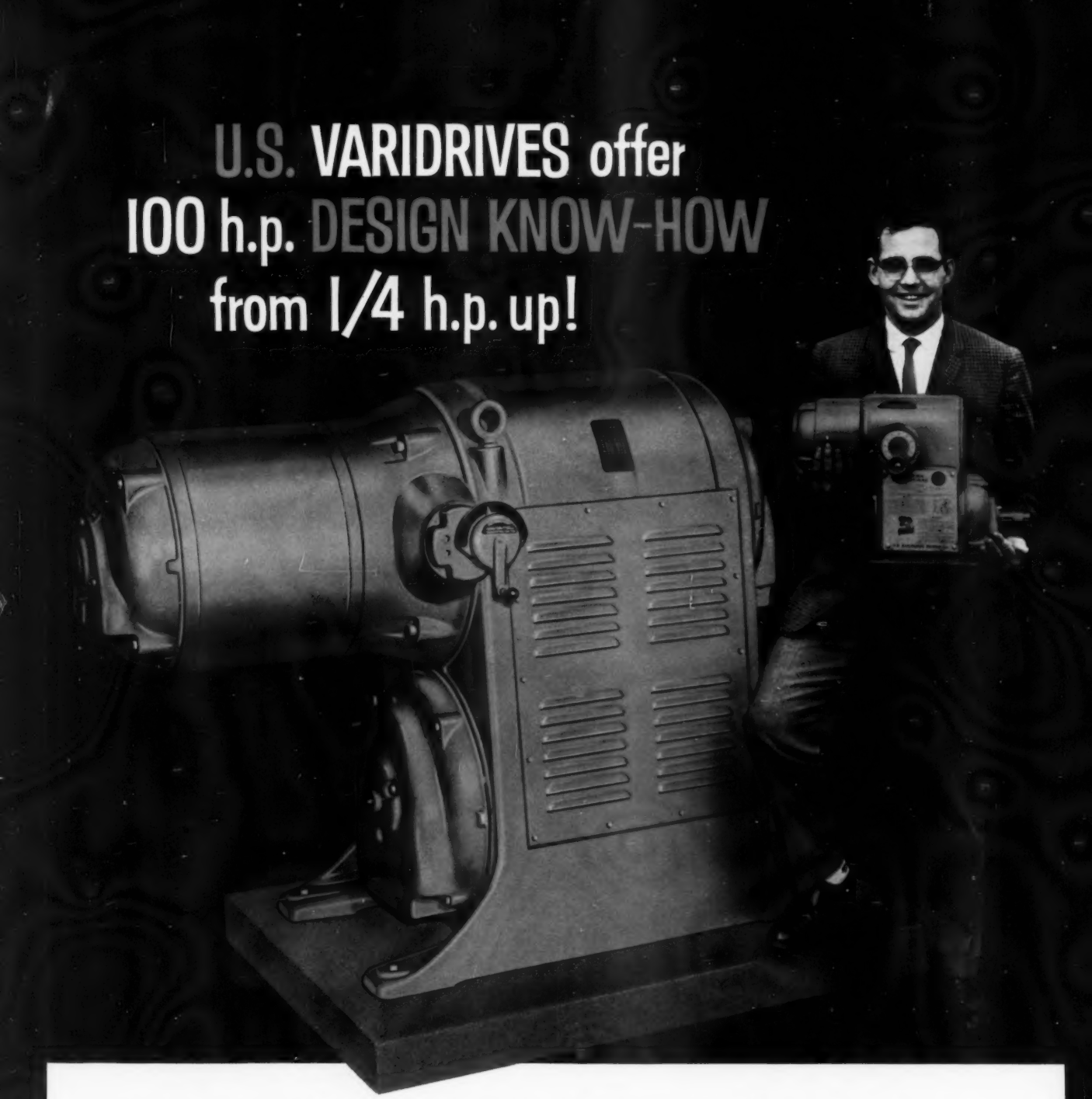
STEVENS RICE
UNIVERSITY MICROFILMS INC
313 N FIRST ST
ANN ARBOR MICH

The Magazine of machine drives–

read by 40,000 who specify power transmission products

for original equipment and in-plant applications

U.S. VARIDRIVES offer 100 h.p. DESIGN KNOW-HOW from 1/4 h.p. up!



NOW we offer 100 h.p. U.S. VARIDRIVE MOTORS, another link in the long chain of design developments pioneered by U.S. Motors. From the time we offered the first VARIDRIVES 29 years ago, right on up the line to today's 100 h.p. model, U.S. design ability has kept VARIDRIVES years ahead. With U.S. VARIDRIVES you are not limited to 40 h.p. As long as 12 years ago U.S. Motors offered its 50 h.p. model—then 60, 75 h.p.—and now 100 h.p. This leadership in design ability serves you, whatever VARIDRIVE you select, with special U.S. benefit features from the ¼ h.p. model up!

U.S. ELECTRICAL MOTORS INC.
Los Angeles 54 (P. O. Box 2058) California—or Milford, Connecticut

FREE COLOR BROCHURE . . . send for Varidrive Bulletin No. F-1797

Circle **44** on Reader Service Card

maurey

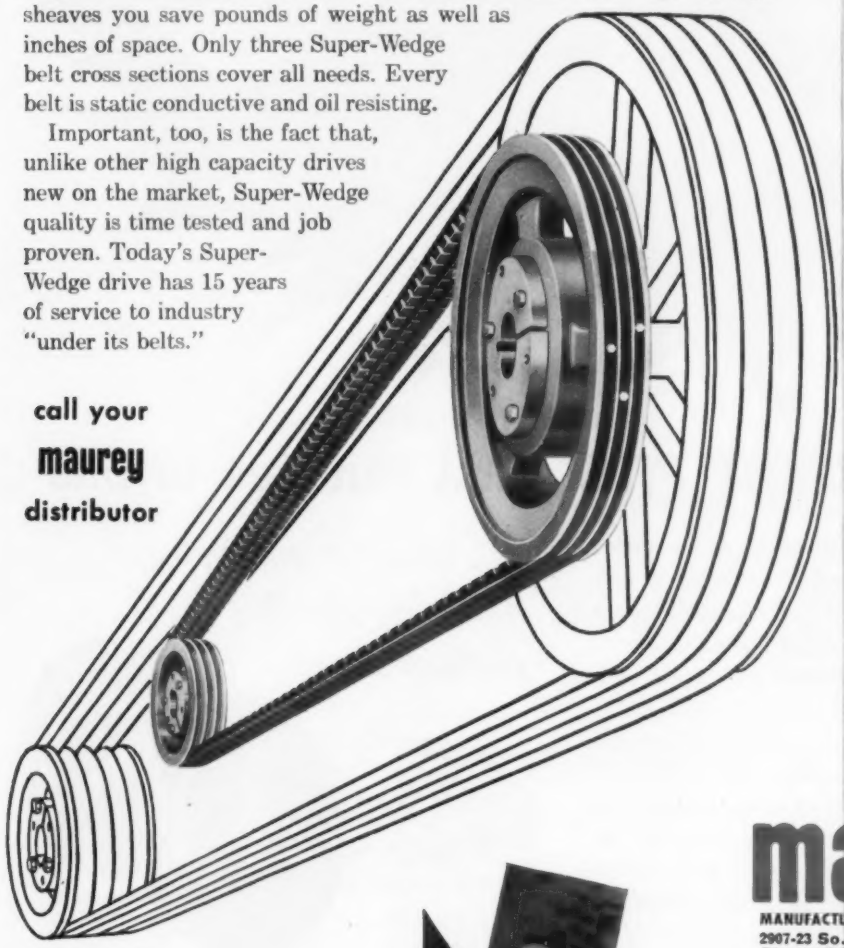
Super-Wedge V-Drives

GET BIG DRIVE CAPACITY
INTO SMALL DRIVE SPACE
AND WHIP THE COST, TOO!

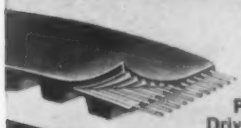
When your drive problem is to cut down the space and keep up the power, Super-Wedge is for you. Super-Wedge belts and sheaves are smaller and lighter, centers are shorter, cost is less, and the power capacity is all there. Narrow, limber Super-Wedge belts have tremendous load carrying strength. Controlled stretch keeps them perfectly matched. Their deep side walls contact fully with the narrow grooves of Super-Wedge sheaves to pull with extra power. With narrow, small diameter Super-Wedge sheaves you save pounds of weight as well as inches of space. Only three Super-Wedge belt cross sections cover all needs. Every belt is static conductive and oil resisting.

Important, too, is the fact that, unlike other high capacity drives new on the market, Super-Wedge quality is time tested and job proven. Today's Super-Wedge drive has 15 years of service to industry "under its belts."

call your
maurey
distributor



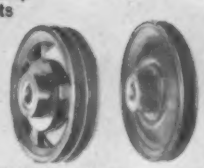
get more **drive**
with Maurey drives



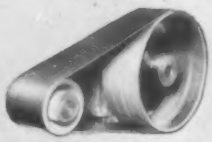
Positive Drive Belts

Variable Speed Belts

Mor-Grip V-Belts



Hi-Q FHP V-Pulleys



Complete heavy duty V-Belt Drives

Maureymatic Variable Speed Transmissions

Sprockets

Roller Chains

WRITE FOR CATALOGS

maurey
MANUFACTURING CORPORATION
2907-23 So. Wabash Ave., Chicago 16, Ill.
Phone: DAnube 6-3151

CATALOG B-60 GIVES DETAILS
not only on the Super-Wedge Drive, but on other proven Maurey quality drives as well.
WRITE FOR YOUR FREE COPY

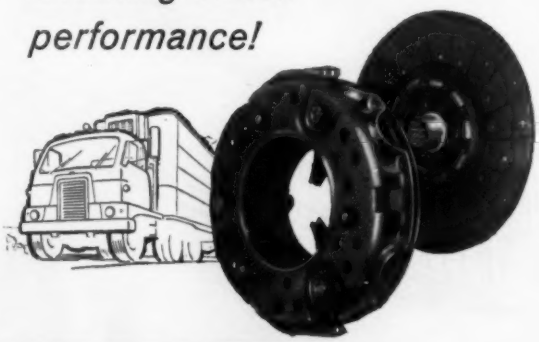
Fast Service from these Maurey Warehouses
CLEVELAND: 3200 Lakeside Avenue • Phone: MAin 1-2242
KANSAS CITY, Mo.: 1728 Walnut • Phone: BAltimore 1-3330

Circle **27** on Reader Service Card

TORTURE-TEST PITS burst clutches to bits

Rockford Clutch reliability is due to the varied and frequent quality checks made at every production step. At specified intervals, clutches are removed from the production line and lowered into torture-test pits. Severe centrifugal tests spin these clutches to destruction! Each tested clutch, however, must withstand predetermined ultra-high speeds for specified time limits . . . another quality control check made to assure you of Rockford Clutch dependability. Rockford offers you an extremely wide range of proven power controls. Write today for illustrated brochure.

. . . assures you safe, enduring clutch performance!



ROCKFORD CLUTCH

1331 EIGHTEENTH AVE., ROCKFORD, ILLINOIS

Export Sales Borg-Warner International • 36 So. Wabash, Chicago, Ill.

BW DIVISION OF BORG-WARNER

Circle **34** on Reader Service Card

POWER TRANSMISSION DESIGN®

THE MAGAZINE OF MACHINE DRIVES

JUNE 1961

volume 3 number 6

PAUL ROLNICK
publishing director

J. J. BUNTING
associate editor

JOHN HOSTAK
associate editor

KENNETH MARSHALL
assistant editor

BERT BENKENDORF
art editor

HAROLD BELANGER
consultant bearings editor

HENRY LEFER
eastern editor

SCHOLER BANGS
western editor

DR. DAVID KINSLER
distilled writing

ALARIC MAUSSER
art director

CAROL SMITH
editorial assistant

FEATURES

TRANSMISSION APPLICATIONS OF CONSTANT-FORCE SPRINGS 17

By H. E. Mankonen and D. C. Schellinger
A new way to transmit power.

PLANETARY GEAR TRAINS—WHERE AND HOW TO USE THEM 21

By Oliver K. Kelley
A simple method of designing planetary gearsets

FLAT PULLEY IS V-BELT SPEED CONTROL 26

Unusual speed control method on an end-rolling machine

CHECK HP WITH MAGNETIC TAPE 28

New electronic device directly measures shaft hp.

WHAT'S IN THE NEW AGMA MANUAL FOR DESIGNERS AND USERS 33

Review of the new classification manual.

A LOOK AT ANTI-SKID BRAKES 36

What they are, uses, types.

BEARING SECTION

APPLICATION TIPS FOR SPLIT NEEDLE BEARINGS 40

By Richard Smith
You can now use split needle bearings on many jobs once reserved for split sleeves.

ONE BEARING REPLACES TWO 42

Details of a 95 in. diameter antenna bearing

IDEAS

AIR-OPERATED CLUTCH CUTS COSTS 44

SPLIT SPROCKET HAS JIGSAW TABS 44

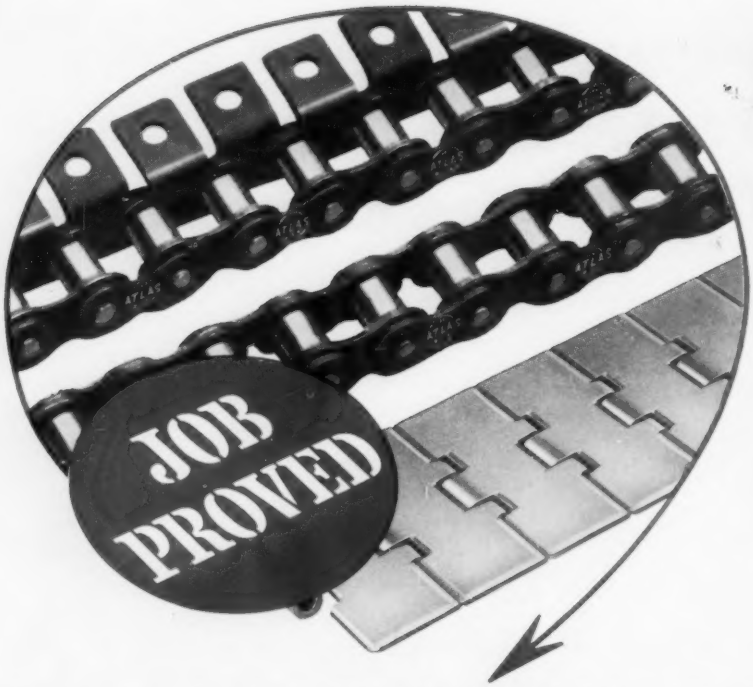
DEPARTMENTS

LETTERS 6
NEWS 8
MEETINGS 13
BEARING BUSINESS 39
***PRODUCT NEWS** 45
***LITERATURE** 56
MEN 60
ADVERTISERS INDEX 64

FACTS AT YOUR FINGERTIPS:

Before going further, tear out a Reader Service Card which you will find bound into this issue. Fill it out as you read and mail it when you're done. We'll act on your request immediately.

copyright 1961 *by The Industrial Publishing Corporation*

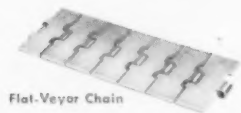


FOR EVERY INDUSTRIAL JOB

ATLAS CHAIN

A.S.A. Roller Chain

Attachment Chain


Flat-Veyor Chain

Extended Pitch Chain

PROVED AND APPROVED ON ALL TYPES OF TRANSMISSION AND CONVEYOR INSTALLATIONS

When you specify Atlas Chain you are certain of maximum performance. Every type of Atlas Chain has been "Job Proved" throughout industry for peak operating efficiency. Every length pre-tested in modern laboratories for unsurpassed quality.

From tiny timers to rugged drives... from fractional horsepower motors to mighty giants... for conveying paper boxes or corrosive liquid containers ... there's an Atlas Chain to fit your most exacting specifications. Singles or multiples... regular or heavy duty... standard or extended pitch... steel, stainless steel, bronze or Electrolized... or Flat-Veyor conveyor chain Atlas makes them in all sizes to meet or exceed A.S.A. requirements.

On present machines or planned drives specify Atlas "Job Proved" Chain for lower operating costs, less servicing and more production. For complete details and catalog contact your nearest Atlas distributor, or write direct to...

ATLAS CHAIN & MANUFACTURING COMPANY
Subsidiary Prudential Industries, Inc.
WEST PITTSTON, PA.

ATLAS
PRUDENTIAL INDUSTRIES
APEGO ATLAS MRC

ATLAS

Circle **23** on Reader Service Card

POWER TRANSMISSION DESIGN

FRANCHISE CIRCULATION — DISTILLED WRITING

BUSINESS STAFF
PAUL ROLNICK .....publishing director
KENNETH MARSHALL ....production mgr.
N. G. KISER .....circulation manager
ROBERT GAUVIN .....reader service mgr.

FRANCHISE DEPARTMENT
LEWIS DAVIS .....representative
RICHARD PLANCK .....production

SALES OFFICES

Cleveland 15
812 Huron Rd., SU-1-9620
ROBERT WALSH

New York City 17
Rm. 836, 60 E. 42 St., MU 7-3420
LEE HAAS, vice president
W. E. HORENBURGER

Chicago 11
Rm. 704, 520 N. Michigan, WH 3-1655
CHARLES F. GEYER, vice president
ROBERT B. NELSON
SAM TRACY

Los Angeles 57
Granada Building
672 S. Lafayette Park Pl., DU 7-5104
ALAN T. CAZIER, manager

London, S.W. 1
36 Victoria St., S. W. 1, SU 6072
JOHN A. LANKESTER, manager

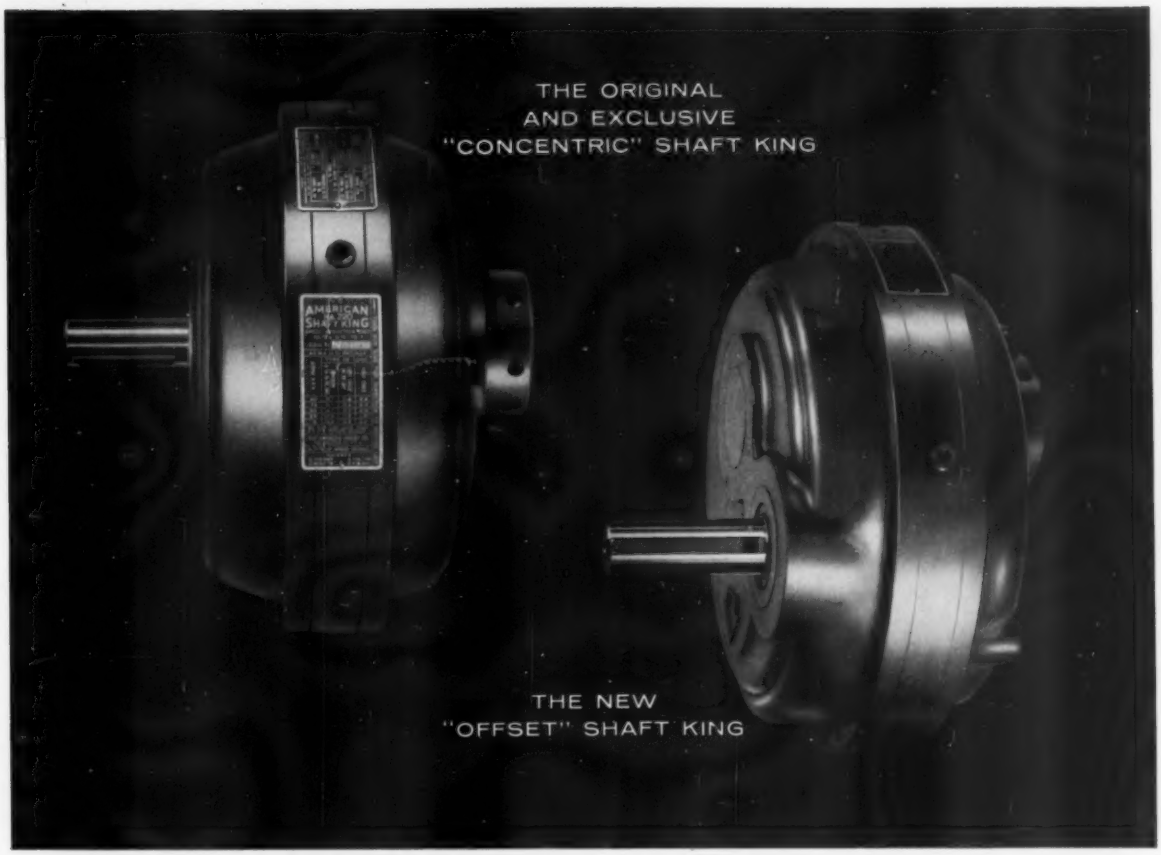
POWER TRANSMISSION DESIGN
is published monthly and copyright 1961 by Power Publishing Company, Inc., a subsidiary of The Industrial Publishing Corporation, 812 Huron Rd., Cleveland 15, Ohio.

LESTER P. AURBACH .....president
EDWIN M. JOSEPH .....executive v. p.
PAUL ROLNICK .....vice president
N. N. GOODMAN, JR. .....vice president
LEE HAAS .....vice president
CHARLES F. GEYER .....vice president
TOM DEMPSEY .....asst. sec./treas.

SUBSCRIPTIONS in U.S. and possessions: $7, 1 year; $12, 2 years. Canada: $8 per year. Foreign: $10 per year, payable in advance in U.S. funds. U.K.: £3.5.0 per year payable in Sterling to London office. Out of print copies of Power Transmission Design are available in complete volumes as positive microfilm copies from University Microfilms, 313 N. First St., Ann Arbor, Mich.

AFFILIATED PUBLICATIONS: Hydraulics & Pneumatics, Material Handling Engineering, Handling & Shipping, Modern Office Procedures, Occupational Hazards, Precision Metal Molding, The Refrigeration & Airconditioning Business, Welding Design & Fabrication. Accepted as a controlled circulation publication at Pontiac, Illinois. Return form 3579 to 812 Huron Rd., Cleveland 15, Ohio.

BPA



First and Still the Finest SHAFT-KING Speed Reduction Drives by

In the popular SHAFT-KING SPEED REDUCTION DRIVES, American Pulley offers you the world's most complete line of shaft-mounted reducers. Whatever your application, you'll find a SHAFT-KING DRIVE to suit it perfectly: from F HP to 60 HP . . . in 5:1, 13:1 and 20:1 ratios . . . and for any drive speed from 5 to 350 RPM.

SHAFT-KING SPEED REDUCTION DRIVES are *performance-proved*, too. Since 1941, when American *pioneered* the shaft-mounted reducer, over 150,000 SHAFT-KING DRIVES have been installed.

Whatever your power transmission problem, there is a standard American Pulley product—or one can be designed—to solve it. Call your American Pulley salesman.

THE AMERICAN PULLEY COMPANY

4200 WISSAHICKON AVENUE • PHILADELPHIA 29, PA.

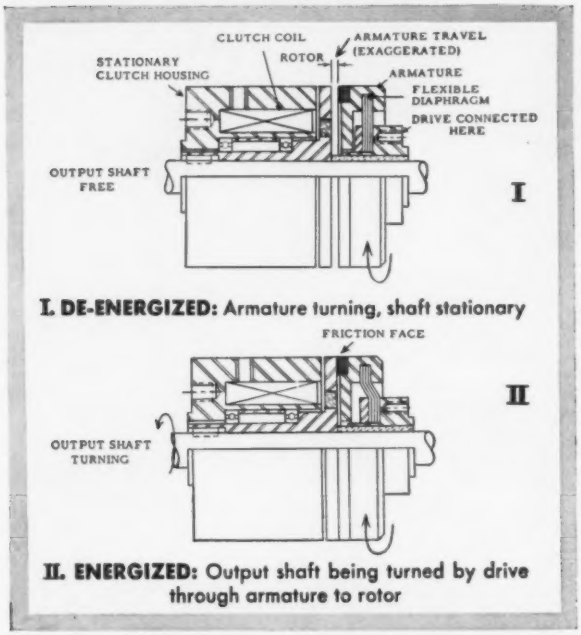
A Division of VAN NORMAN INDUSTRIES INC.

2000-A

Circle **2** on Reader Service Card

Choose A Diaphragm Electric Clutch

for Superior Performance Lower Installed Cost



Like most really sound engineering ideas the practicality and economy of electric clutches and brakes without the conventional sliding armature had to be proved in practice.

Now, a few short years after their introduction, Simplatrol electric clutches and brakes have proved that their design, based on a flexible diaphragm in the clutch's armature, does do a better job than armature plates sliding on splines, pins, or hubs.

Simplatrol's armature, a **one-piece** assembly, deflects to perform clutching or braking action. Wear is reduced to vanishing point since there are no sliding parts to contact each other; instant performance is achieved without slow release, or "hanging up."

This Simplatrol diaphragm principle ensures smoothness, quietness, and consistency.

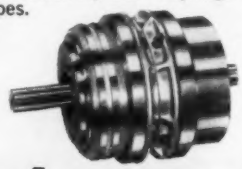
Compare the installed cost.

Simplicity carries through to the installation, reducing cost here as well. You simply slip one of the 2 or 3 major assemblies onto the shaft — that's all the assembling you do! No pins, no nuts, no washers, no springs to run up labor cost.

Machined parts in the clutches and brakes are of uniform quality. There's close built-in control of tolerances and finishes . . . and the assemblies are pre-burnished! All clutches include bearings, machined surfaces and bolt holes for direct mounting of your drive unit.

Simplatrol offers a complete range of diaphragm electric clutches from torque of 10 ounce inches to 470 pound feet in diameters from ⅞" to 12½". Styles include clutches, brakes, clutch-brakes, duplex clutches, and couplings in both rotary and fixed field types.

Ask Simplatrol's sales engineers to demonstrate to you specifically how the unique advantages of flexible diaphragm performance will benefit your operation.



Simplatrol products corp.
24 SALISBURY ST., WORCESTER, MASS.
Representation in Key Industrial Areas

359-D

Circle **38** on Reader Service Card

LETTERS

Tear sheets, please

Please send me copies of *An Introduction to Friction Clutches and Brakes*, and *Positive Contact Clutches and Brakes*. Unfortunately, when POWER TRANSMISSION DESIGN gets to me, a lot of the pages have been clipped. So please send me tearsheets of *Hydrostatic Adjustable Speed Drives*, and *Torque Converters*, and your *Bearing Design and Application* articles.

GOODYEAR TIRE AND RUBBER CO.
Engineering Dept. 110-D
Michael Sidorovich
Designer

Would you like to contribute to our forthcoming article: "Are Engineers Packrats? . . . Tearsheets of all available articles you requested have been sent.

An April error

The selection guide in your April feature article *Flexible Couplings*, shows Dodge Corp. as producing only the flexible non-metal type of couplings. Our D60 catalog will show, however, that our line also includes chain and pin-type couplings.

Incidentally, we thought the coupling analysis was very good.

DODGE MANUFACTURING CORP.
Carlton Shamo,
Manager, Press Relations

Our mistake—we apologize.

Our 60/61 Directory

Thank you. I appreciate your sending the POWER TRANSMISSION DESIGN HANDBOOK AND DIRECTORY very much.

DIAMOND CHAIN CO., INC.
R. E. Kessler

You're welcome. A small number of PTD HANDBOOK AND DIRECTORY*'s are available at $12 each. We publish it every two years and the next one is due out in the Fall of* 1962.

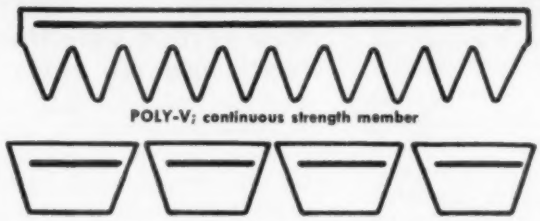
Design problems

I read your magazine regularly and learn much from it that I could not find out otherwise.

But one deficiency is your complete lack of design problems. Why don't you give some worked out examples for those of us who design power transmissions?

JEMA CO.
C. Teiniber,
Engineer

Thanks for the pat on the back. As to why we don't work out examples: we do. There haven't been many in recent issues, but regular readers will be familiar with both specific problem solutions and our general solutions—nomograms.



"MORE USE PER DOLLAR"

Poly-V Belt is a single unit with even, uniform pull. Uninterrupted strength member gives much higher hp capacity per inch of drive width. No belt drive delivers as much power in the same space as Poly-V!

Steel Mill Converts to R/M POLY-V BELT on Rugged Hot-Saw Drive!

A 34½" wide R/M Poly-V® Belt of 92 ribs now delivers "power plus" on this punishing hot-saw drive at one of the country's largest steel works. Converting to Poly-V eliminates the problems of a multiple V-belt drive . . . matching, stretching, overloading, whipping and snapping of individual V-belts.

The patented Raybestos-Manhattan Poly-V Drive is a single unit, V-ribbed belt design that mates perfectly with Poly-V sheave grooves, eliminates V-belt stretch and length matching problems . . . reduces costly machine downtime and production slowdowns for individual belt replacement. Sheave ratio and belt position remain constant from *no* load to *full* load . . . assure smooth, *complete* power delivery under the toughest drive conditions. Poly-V Belt can't sink in the grooves under surges of load. This means less wear on belts and sheaves . . . and much more power in the same space as a multiple belt drive—or equal power in much less space!

Just two Poly-V Belt cross-sections meet every heavy duty drive requirement. Let an R/M representative show you how Poly-V Drive can give you greater power-packed performance and drive dependability . . . "More Use per Dollar" than the drive you now use. Write for Bulletin M141.

RM1020

When You Change Drives . . . Convert to R/M Poly-V Drive and Be Sure!

RAYBESTOS-MANHATTAN, INC.

MANHATTAN RUBBER DIVISION, PASSAIC, NEW JERSEY

R/M

ENGINEERED RUBBER PRODUCTS . . . MORE USE PER DOLLAR

Circle **32** on Reader Service Card

NEWS

from the power transmission field

Army retriever brings back the DUKWs

A collapsible landing craft retriever is the latest thing in recovery equipment for the U. S. Army Transport Corp. It stands 25 ft high, 36 ft wide, weighs 70 tons itself and will retrieve a 70 ton landing craft from the sea in ten feet of water. It will good-naturedly carry 140,000 pounds up a 20 percent grade at one mph, and will even operate with its tires 30 inches deep in sand.

The Mark II retriever is basically a self-propelled gantry crane, which can be broken down into eight pieces, each small enough to be transported by barge. Then, if all the barges arrive on time, it can be assembled in eight hours by means of winches and cranes.

Each side of the machine is driven independently from a drive system mounted in the side beam on the side it drives. The operator works the controls from a central panel on top. The power train on each side is a reversing power-shift transmission (four forward, four reverse speeds) driven through a torque converter by a 250 hp, 534 cu in. displacement Ford V-8 engine. External clutches and simple spur gears ensure easy maintenance and reliability.

Mark II (Mark I was not collapsible) can turn in its own radius in two ways. It can be skid-steered by setting the brakes on one side and gunning the wheels on the opposite side. Or it pivots by driving the wheels on one side in reverse while the wheels on the opposite side drive forward.

The machine will spin two wheels in low gear at any time before the engine stalls. This is important protection for gears, engine and torque converters. Top speed of the Mark II is 10.3 mph, with a cruising speed of between 1 and 5 mph, depending on load.

Torque converters provide four extra pumps to supply the hydraulic system. Each converter has a 14 in. wheel, with a torque multiplication of 2.91 at stall point. Maximum input rpm is 2400, and maximum input torque at stall is 350 ft lb.

The suspension system includes hydraulic cylinders that adjust the wheels to uneven ground and keep the weight divided evenly. Hydraulic apparatus also includes hoisting cylinders for lifting lines and salvage pumps to empty flooded boats.

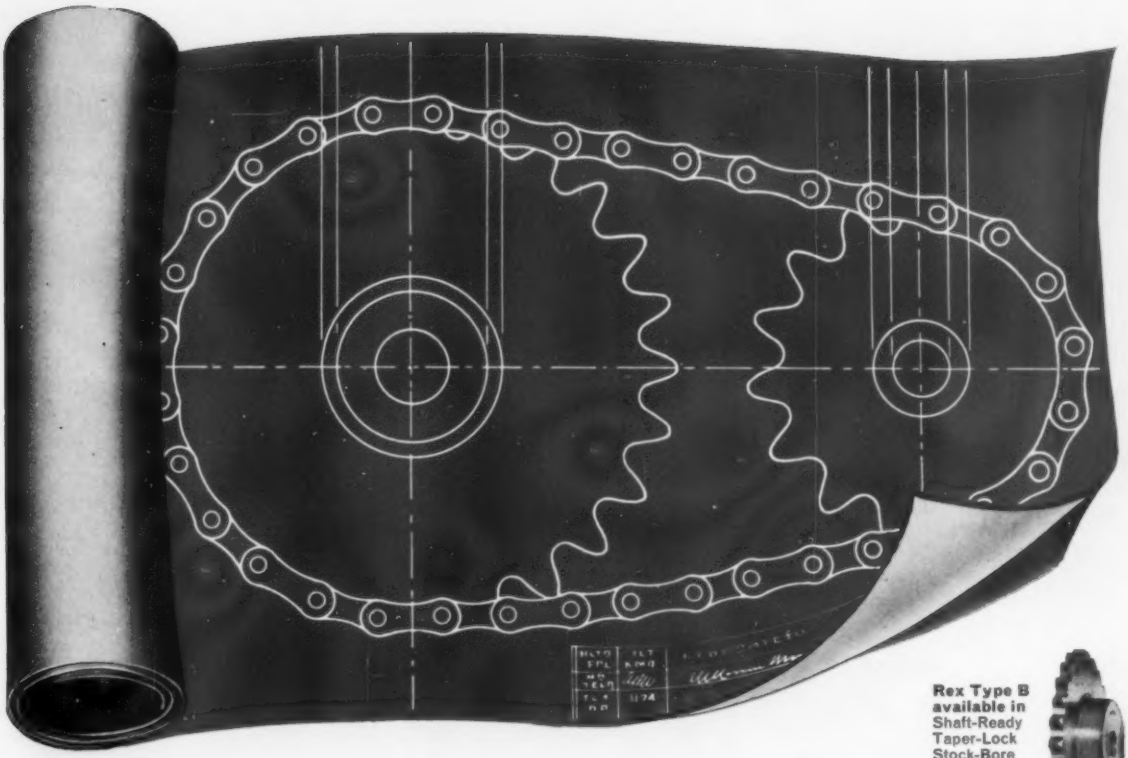
The Mark II was built by Skagit Steel and Iron Works, with the power train from Clark Equipment Co's Automotive Div.

New system simplifies tooth spacing tests

A simple tooth-space checking system that also graphically helps identify causes of tooth-spacing errors in straight or helical gears and splines has been developed by Michigan Tool Co. This system, now available to industry, provides a simple means of measuring pitch-line run-out and eliminating its effects on an index check. The inspection can be made without analysis by a highly trained man. A short training session in the technique enables the average machine operator to check toothed parts and accurately determine tooth-spacing errors.

The basic system comprises a checker of new design, translucent charts, and a light table. Since the system is designed for either production checking or laboratory use, mechanical units are sturdy, and adjustments can be made quickly and easily.

The new Model 1132 Tooth Spacing and Concentricity Checker used with this system comprises a bed with ways, an adjustable



It's right on paper... but is it right on your job!

A new chain, new sprockets—both the right type and size for the job, both properly installed and serviced. But the chain failed prematurely.

Faulty chain? No. The replacement chain failed, too!

Could it be the sprockets? Very probably—even though they were correctly selected. Improper manufacture can cause quick failure.

Rex research has proved conclusively that even the slightest error in holding sprocket design tolerances can cause tremendous chain wear. An *oversized* sprocket bottom diameter or root diameter is a common cause of chain failure. It can cut chain life by 50% to 70%.

That is why, in every Rex Sprocket, this critical area is specially designed—is cut to precision tolerances. This assures you that the sprocket you select is not only right on paper, but is right on *your* job. No wonder Rex Sprockets are known for extending both chain and sprocket life.

REX HAS A COMPLETE LINE IN STOCK

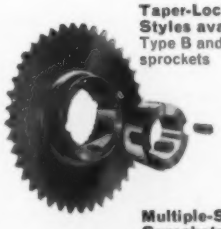
The Rex Sprocket line offers you a complete selection—makes it easy for you to get the right sprocket for your specific job. Modern CHAIN Belt manufacturing and quality control methods make sure you get the life and service promised in Rex design.

See your Rex Distributor or write CHAIN Belt Company, 4734 W. Greenfield Ave., Milwaukee 1, Wis. In Canada: Rex Chainbelt (Canada) Ltd., Toronto and Montreal.

Rex Type B available in Shaft-Ready Taper-Lock Stock-Bore

Rex Type C available in Stock-Bore and Taper-Lock

Rex Type A available in Stock-Bore



Taper-Lock Styles available in Type B and C sprockets

Multiple-Strand Sprockets available in Type B and C

REX®

CHAIN BELT COMPANY

Circle **12** on Reader Service Card

Elliott

FLEXIBLE SHAFTS

- CUT COSTS
- SAVE TIME
- ELIMINATE MOVING PARTS

Elliott Flexible Shafting drives machine used for slosh-vibration tests of aircraft fuel cells with gross weight of 7 tons. Machine rocks through 30-degree arc on concave track. Flexible shafting drives vibrating table 2800 cycles per minute in full ⅛" circle.

Textiles are sized, stretched and dried on above machine. Fabric is transferred to picks on moving overhead tracks and carried out 100' for sizing and drying. Two Elliott Flexible Shafts perfectly synchronize lateral motion and varying speed in pick drive.

Elliott is America's largest manufacturer of flexible shafting for concrete vibrators. Dryer mixes, stronger, more uniform concrete are the results.

Write for our Catalog **263**

FLEXIBLE SHAFT DATA FOR DESIGNERS

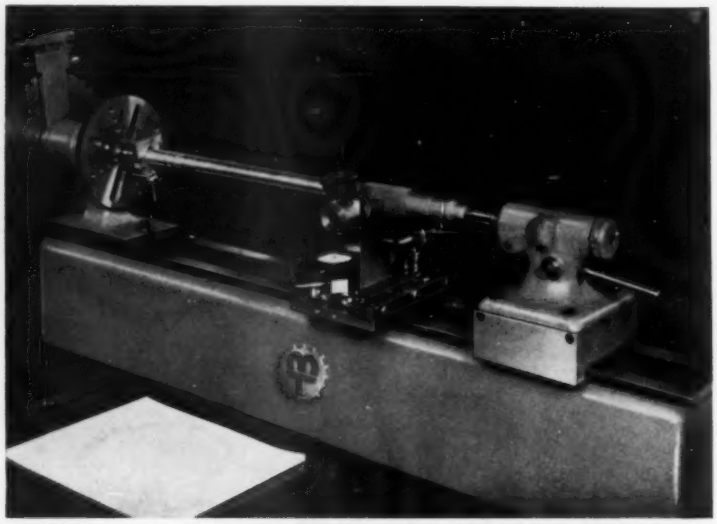
B.W. ELLIOTT MFG. CO., INC.
251 State St., Binghamton, N. Y.

Circle **16** on Reader Service Card

NEWS

pointer carriage and slide, two dial indicators and a pair of centers. The standard unit (large checkers are available) will accept shafts up to 36" long and 5" OD having a wide range of pitches. This unit features a quick-acting adjustable tail-stock and over-travel protection for both indicators.

The workpiece is positively indexed through use of an index plate—several of which for different numbers of teeth (odd or even) can be simultaneously mounted on the checker. A rack-type pointer tip pivots so it contacts both flanks of a tooth near the pitch line at the time measurements are taken. The pointer unit can be swiveled so the tip matches the helix angle of the workpiece. Pointer tips can be quickly interchanged.



CHECKER, translucent chart and light table make up new tooth checking system.

Disc brake for Atlas launching platform

A disc brake weighing 153 lb is used to hold the launching platform of the 265,000 Atlas missile against the shock loads of firing. The brake, built by the Goodyear Tire and Rubber Co., is being produced for the entire nationwide complex of Atlas launching sites.

Its secondary role is to prevent damage caused by mechanical failure of the drive system. If either the hydraulic or electrical system of the launching platform fails while the Atlas is being raised to ground level for firing, the brake automatically locks the platform in position and stops the explosive missile from falling to the bottom of its sub-surface silo.

Heavy springs and hydraulic pressure actuate the brake. It snaps into action the moment hydraulic pressure compressing the springs is removed, either intentionally or because of failure. Damage to sensitive parts of the launching mechanism during an emergency is prevented by the brake's action.

Engineer's salaries up, want-ads down

Engineer's salaries during 1959-60 continued to rise, according to a recent survey published by the Engineering Manpower Commission. The overall median for all engineering graduates for 1960 was $9600, as compared with $8500 for 1958, $7750 for 1956 and $6500 for 1953.

The report (available from Engineering Manpower Commission, EJC, 29 West 39th St., New York

Excessive heat build-up caused by constant flexing — even in environmental temperatures — is the major cause of V-belt deterioration. BOSTRON with Neoprene remedies this problem.

Neoprene withstands heat up to 165°F. (ordinary belts deteriorate at as low as 115°F.), and gives greater resistance to oils, ozone, chemicals, abrasion. This means a high safety margin, long life.

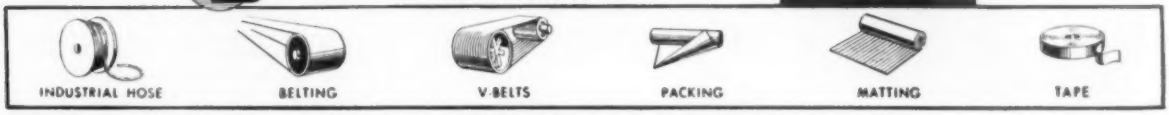
Neoprene with Fiber-Dispersed Stock in BOSTRON'S compression member provides: (1) high cross-wise rigidity, (2) exceptional length-wise flexibility, and (3) extra tensile member support. Fibers are closely packed, in straight lines, and virtually frictionless.

BOSTRON'S Tensile Member, by actual test, gives greater stability, 40% more strength, and is inherently stretch resistant. Moisture gain is only 1/20th that of conventional reinforcing fiber. A special heat and tensioning process for the cords further minimizes stretch. BOSTRON withstands more shock loading, needs less maintenance, and shows minimum growth even after months of operation.

Inside and out, your best buy is **BOSTRON V-BELTS** *with* **NEOPRENE**

AMERICAN BILTRITE RUBBER COMPANY
BOSTON WOVEN HOSE & RUBBER DIVISION
BOSTON 3, MASSACHUSETTS

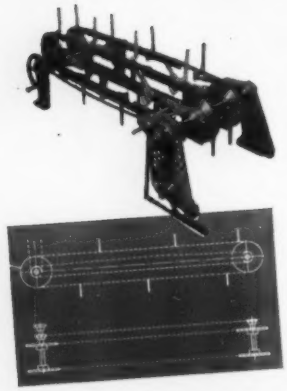
BOSTON

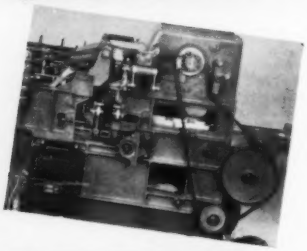


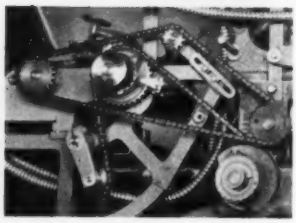
Circle **9** on Reader Service Card

ACME

ENGINEERS FLY OVER 100,000 MILES A YEAR TO RENDER SERVICE







Acme backs its quality Power Transmission Products with the best engineering service available in the industry. Even on short notice, Acme has its Engineers available to put their years of experience and technical knowledge to work in helping you solve a design, installation or any other chain drive problem you may have.

Acme has built its reputation on providing customers dependable service *before*, *during* and *after* the sale.

Wherever you are, whatever your problem, there's an Acme Engineer as close as your telephone, ready and willing to lend his assistance just for the asking. When your drive problems require service, call Acme.

INDUSTRIAL DISTRIBUTORS SERVING INDUSTRY ECONOMICALLY THE RIGHT HAND OF PRODUCTION

Write Dept. 28-S for new ill. 100 page catalog with engineering section.

Acme Chain Corporation
HOLYOKE MASSACHUSETTS

RELIABLE CHAIN DRIVES FOR ALL INDUSTRIES

ROLLER CHAINS, SPROCKETS, CONVEYOR CHAINS, FLEXIBLE COUPLINGS, ATTACHMENTS. (Special and Standard)

Circle **1** on Reader Service Card

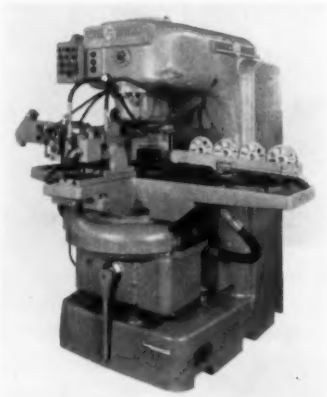
NEWS

18, N. Y.—$3 a copy) comes from a survey representing some 200,000 engineers in industry, government and education. The fourth in a series of surveys, it analyzes salaries on the basis of years since baccalaureate degree, since there is no commonly accepted job classification system.

The less rosy side of the picture comes from the Engineer/Scientist Demand Index compiled by Deutsch & Shea on the basis of recruitment advertising. It shows that the demand for technical manpower, which has been falling for over a year, continues to drop. Since January 1960, there have been only a few periods of slight upturn in a gradual decline.

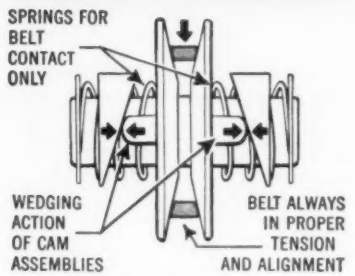
Fuel cell possibilities for Army vehicles

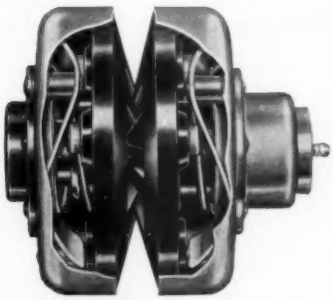
Sleek, highly mobile armored vehicles powered with fuel cells are foreseen as the successors to tanks and other military ordnance vehicles in an electrical propulsion study made by the Army. A report in this study is now available through the Office of Technical Services, Business and Defense Administration, U. S. Department



AUTOMATIC IN-LINE LOADER made by National Broach and Machine Co. handles a 5.8793 inch pitch diam. helical cam shaft timing gear. The loader, shown installed on a rotary gear shaving machine, feeds gears in a straight line across the machine or through a battery of machines. This method of feeding permits automatic handling of larger diameter gears than previously possible in a machine this size.

HOW HI-LO'S CAM CONTROL GIVES GREATER VARI-SPEED EFFICIENCY





1. Opposite wedging action of the exclusive patented cam and cam follower assemblies prevents pulley spread.
Result: constant speed is maintained at all times, even under overload conditions.

2. Cam action also automatically compensates for tension and alignment.
Result: belt is never under more tension than required by the load, always in proper alignment.

3. Springs are not driving members but serve only to keep pulley faces in contact with the belt.
Result: smooth and steady transmission of power, belt is never subjected to excessive spring pressure and lasts longer.

Hi-Lo Pulleys described above are available in standard V-belt series from fractional to 5 hp. (1750 rpm.), ratios to 2.6 to 1 and in wide V-belt series from 1 to 5 hp. (1750 rpm.), ratios to 3 to 1.

For full details on these and also Hi-Lo's economy and high ratio lines request Bulletin H-61.

MANUFACTURED BY
HI-LO MANUFACTURING COMPANY

AFFILIATE OF
Lovejoy Flexible Coupling Co.
4991-H WEST LAKE STREET, CHICAGO 44, ILLINOIS

Circle **21** on Reader Service Card

of Commerce, Washington 25, D. C.

Among the potential advantages of a fuel cell and electric motor system are flexibility, fuel economy and less field maintenance. During an average combat day of 18 hours, vehicles stand with motors idling more than 7 hours, or about 40 per cent of the day. Electric motors draw power from the cell only when the vehicle is moving. Also, with electric motors driving each powered wheel, damage to one or more wheel need not knock out the vehicle.

Considering other systems, the report estimates a possible maximum increase of only 3 per cent in diesel engine efficiency through design improvements (from present 37 to 40 per cent). And, shielding weights and fuel costs rule out nuclear power.

The report is: *A Study of Electrical Propulsion of Ordnance Land Vehicles.* H. D. Cather. Cost —$1 per copy.

Business news in brief

. . . **General Electric Co.**—established a foreign and component sales operation, together with a realignment of sales responsibilities in the Distribution Transformer Dept.

Continued on page 14

MEETINGS

JUNE

4- 7	American Gear Manufacturers Association, Annual Meeting, The Homestead, Hot Springs, Va.
8- 9	National Electrical Manufacturers Association, Western Conference, Biltmore Hotel, Los Angeles.
11-15	American Society of Mechanical Engineers, Summer Annual Meeting, Statler Hilton Hotel, Los Angeles.

GEARED to the FUTURE
SPUR GEARS AND PINIONS
BEVEL GEARS AND PINIONS
MITER GEARS
WORM GEARS AND WORMS
BOND STOCK GEARS are engineered applicable to every requirement . . . present and future. Engineered for greater ECONOMY, STRENGTH, ACCURACY and UNIFORMITY.
BOND Stock Gears are available for immediate delivery from our master stock or from coast-to-coast Distributors. Engineers, draftsmen, machine builders and users specify BOND for dependable quality.
Let our catalog work for you. Detailed engineering charts and diagrams save you time, making Gear specifying fast, easy and accurate.
Write for your FREE copy today.
CHARLES BOND
Bond COMPANY

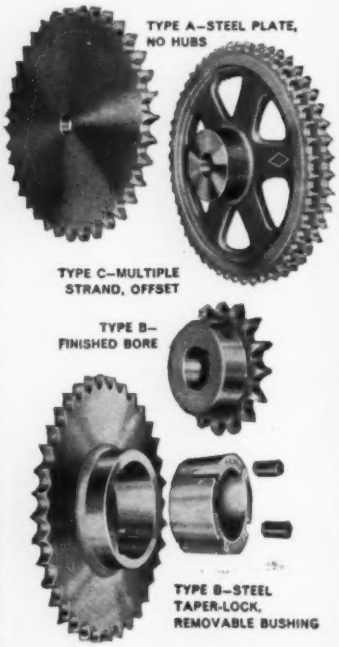
Circle **8** on Reader Service Card

FOR EVERY NEED

DIAMOND

MINIMUM BORE AND READY-TO-USE

STOCK SPROCKETS



Write for Stock Roller Chain and Sprocket Catalog

Get complete information on DIAMOND's full line of sprockets available from your Distributor's stock! New catalog contains dimensions and list prices; bushing installation and removal instructions. Write for your copy today!

DIAMOND CHAIN COMPANY, INC.

A Subsidiary of American Steel Foundries

Dept. 718 · 402 Kentucky Ave.

Indianapolis 7, Indiana

Circle 14 on Reader Service Card

NEWS

. . . **Aerojet-General's Nuclear Propulsion Div.** received a $500,000 Air Force contract for nuclear rocket engine research. The company is preparing preliminary designs for nuclear propulsion systems ranging from the upper stage thrust levels to multi-million pound thrust boosters.

. . . **Minneapolis-Moline Co.**—formed an Automotive Div. which manufactures a full line of gasoline, LP gas, diesel and natural gas engines, transmissions, torque converters, shuttle gears, axles, gear boxes and related products.

. . . **Garrett Corp.'s AiResearch Mfg. Div.**—received a contract of over $1,000,000 for development and delivery of pumping systems for the U. S. Airforce-Northrop Laminar Flow Control test aircraft.

Allied Committee of MPTEDA meets in Chicago

The recently-formed Allied Committee of the Mechanical Power Transmission Distributors Association met at Chicago's O'Hare Inn on April 24. Under the chairmanship of H. Merrill Bowman, members heard from MPTEDA president Warren M. Pike, in his state of the Association address, of continuing manufacturer interest in both promoting membership and the technical training schemes.

In the Committee reports, Mark T. Gilkison emphasized that manufacturers and distributors must work together to solve problems of distribution. It must be a joint effort, Gilkison said, one cannot get along without the other. This is one of the major problems in fighting the profit squeeze.

R. D. Prushing, membership chairman, appointed J. F. Taylor, Joe Martin, Jr., and R. D. Black to the Committee. Members attending were:

J. F. Taylor, Maurey Manufacturing Corp.; A. W. Jacobs, American Stock Gear; A. D. Siedle, Speed Selector, Inc.; R. D. Prushing, The Jeffrey Manufacturing Company, Garth Stroup, Dodge Manufacturing Corporation; Norman B. Wienke, Cullman Wheel; G. S. Tigney, Waldron-Hartig; W. B. Briggs, Lovejoy; Mark T. Gilkison, Gates Rubber Company; K. R. Steinmetz, Gerbing Manufacturing Corporation; Joe Martin, Jr., Martin Sprockett;

THE GRINDING SHOP in the 220,000 sq ft-addition to the Fafnir Bearing Co's Newington plant. Designed for the manufacture of a large variety of bearing types and sizes—mainly large ones—the new plant has a continuous material and work flow system from raw steel stock through machining and assembly. Collection and disposal of chips and scraps is automatic. The plant can produce 50,000 bearings a day on a two-shift basis.

C. B. Cronin, Gerbing Manufacturing; R. D. Black, Zero-Max Company; Lester Aurbach, Robert Walsh, "Power Transmission Design"; Andrew Novsad, Gebbing Manufacturing Corporation; John W. Rice, Phillip D. Thompson, Fort Worth Steel & Machinery; Mike Ecksel, "Industrial Distributor News"; Arch Henry, Warner Electric; Henry Popular, Accurate Gear Works; Howard Bennett, Morse Chain Company; Frank W. Jordan, Secretary; Warren M. Pike, Warren M. Pike Associates; H. Merrill Bowman, T. B. Wood's Sons Company; Anton M. Andersen, Bonner and Barnewall; Lester V. Jones, Len W. Adams, Goodyear Tire & Rubber Company; D. E. Tessendorf, Worthington Corporation; Carter B. Haley, Ernie Shires, Durkee-Atwood Company; Russell B. Malloy, Maurey Manufacturing Corporation; Gerald Nordley, Hi-Lo Manufacturing Company; R. G. Burson, J. C. Conlon, Norman Lever, Dayton Ind. Products; James Gavin, R. S. Egbert, Globe Gear Company.

Walter Kemphert dies; was PTD editor

Walter W. Kemphert, general manager and editor of POWER TRANSMISSION DESIGN, died Sunday April 30th, after a short illness.

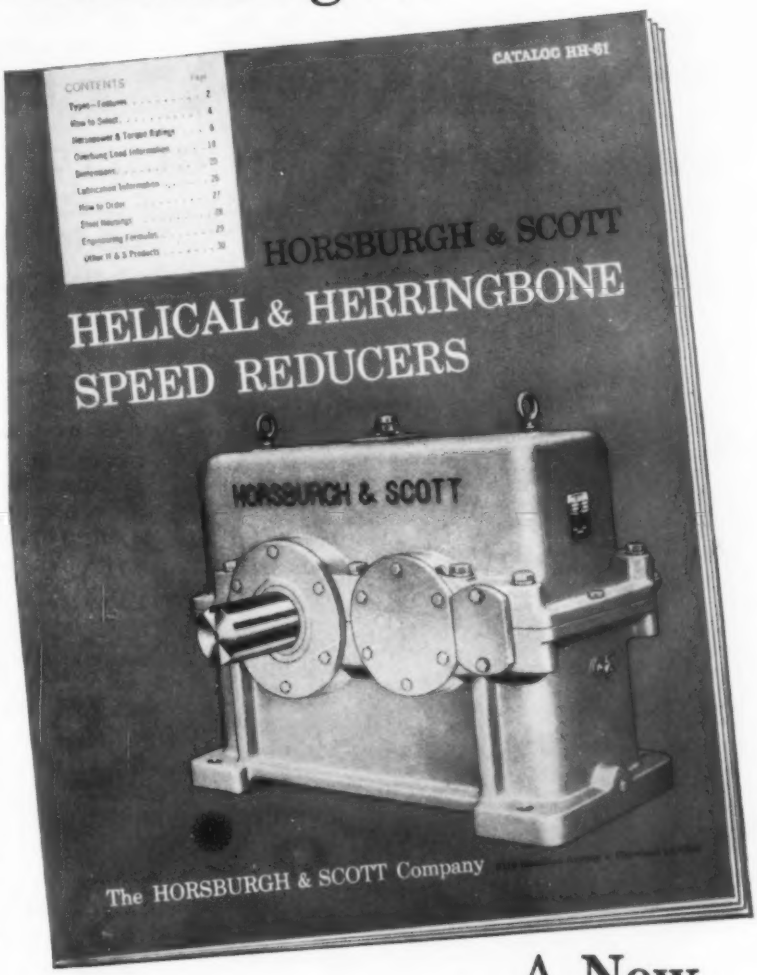
Walter Kemphert was a prominent figure in the power transmission industry. He was a past president of the Multiple V-Drive Association and a vice president of American Supply and Machinery Manufacturers.

WALTER KEMPHERT

A graduate of Northwestern University, he began his career as sales manager of the Multi-V-Drive dept. of Worthington Corp., Chicago. He joined PTD in November 1960, and in the short period of his editorship did much to widen the scope and acceptance of this magazine.

He is survived by his wife, Bernice, and three children.

Introducing . . .



. . . A New

HORSBURGH & SCOTT

SPEED REDUCER CATALOG

To Simplify Selection of Speed Reducers for Industry

New catalog features include:

New Sizes • Improved Ratings • More Ratios • Latest AGMA Thermal Ratings • Simplified Selection • Easy-to-use Overhung Load Ratings • Steel Housings.

Write for **Catalog HH-61**—on your company letterhead, please.

Let our engineering staff give you prompt assistance with your enclosed gearing requirements.

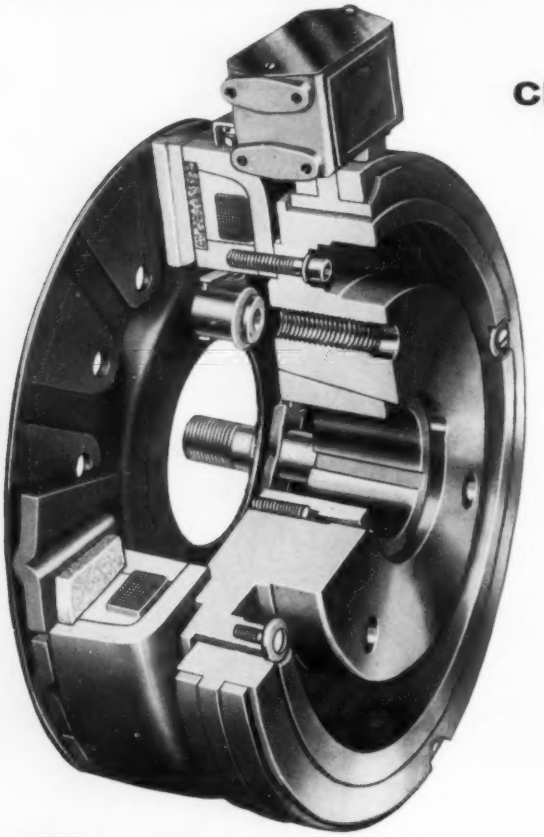
The HORSBURGH & SCOTT Co.

5112 Hamilton Avenue • Cleveland 14, Ohio

Circle **20** on Reader Service Card

EATON
DYNA-TORQ®

MAGNETIC-FRICTION CLUTCHES and BRAKES



The Ideal Solution to Exacting Clutching and Braking Problems

These highly responsive, trouble-free units provide accurate control of intricate automatic machinery. Operating on 6, 12, 24 or 90 V.D.C., Dyna-torQ units may be actuated by micro-switches, photo-electric cells, relays or any "ON-OFF" signal to perform a wide range of functions in processing and fabricating applications. The compact rectifier type control converts AC power to DC power and may be remotely mounted out of busy machine areas.

Eaton Dyna-torQ Clutches and Brakes are available from 1¾" through 15" in diameter. They may be easily and quickly installed on either new or existing plant equipment. Exclusive features of design and construction mean worthwhile savings.

HP @ 1800 R.P.M. *(Typical Application)*

MODEL	HP	MODEL	HP
302	1/20	308	7½
303	⅓	310	10
304	1	312	20
305	2	315	25

Dyna-torQ Distributors in many principal cities carry Dyna-torQ Clutches and Brakes in stock for immediate delivery.

EATON

ACCURATE POWER CONTROL

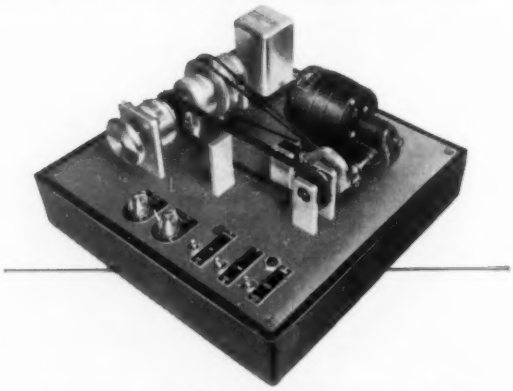
DEPENDABLE MOTION CONTROL

RAPID RESPONSE • LOW MAINTENANCE COST

EASY BUILT-IN INSTALLATION

WIDE RANGE OF SIZES AND CAPACITIES

Send for Illustrated Literature.



Ask your Dyna-torQ Distributor to demonstrate Dyna-torQ in action and see for yourself the many possible applications for Dyna-torQ in Motion Control and Power Transmission.

EATON *DYNAMATIC DIVISION*
MANUFACTURING COMPANY
3122 FOURTEENTH AVENUE • KENOSHA, WISCONSIN

Circle **15** on Reader Service Card

POWER
TRANSMISSION
DESIGN
JUNE 1961

Transmission applications of CONSTANT-FORCE SPRINGS

- **GEAR SUBSTITUTION**
  . . . eliminates rack and pinion.
- **MECHANICAL LINKAGE**
  . . . allows precise operation of cam and rollers.
- **ANTIBACKLASH**
  . . . winds instruments without reaction.
- **SCREWJACK**
  . . . provides extra torque for manual operation.
- **SERVOMECHANISM**
  . . . lifts heavy weight at remote location.

By H. E. MANKONEN and D. C. SCHELLINGER,
Neg'ator Div., Hunter Spring Div., American Machine & Metals Inc., Lansdale, Pa.

CONSTANT-FORCE SPRINGS continue to offer new ways to transmit power and motion. They often outperform conventional transmissions. For example, they are quieter and cheaper than gears. They do not stretch as do belts. They are devoid of backlash.

The constant-force spring is a strip of spring material which is curved by heat and continuous heavy forming. Relaxed, it coils into a tightly wound spiral.

Constant-force springs transmit oneway and oscillating motions. They can also be used to convert linear motion to rotary motion, and vice versa. Springs are available in two forms: extension springs, Fig. 1; motor springs, Fig. 2.

The restraining force of the spring does not increase as the spring extends. This distinguishes the constant-force spring from an ordinary spring.

For use as an extension spring, the coil mounts on a freely rotating bushing. The spring opposes any extension of its outer end with a force that is independent of the length of extension.

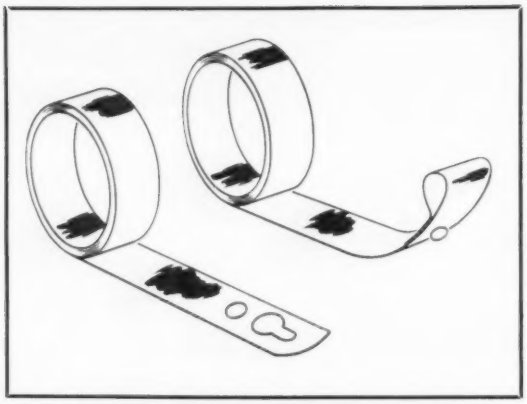


FIG. 1. CONSTANT-FORCE EXTENSION SPRING resists withdrawal from its coil with a force that remains constant throughout the spring deflection.

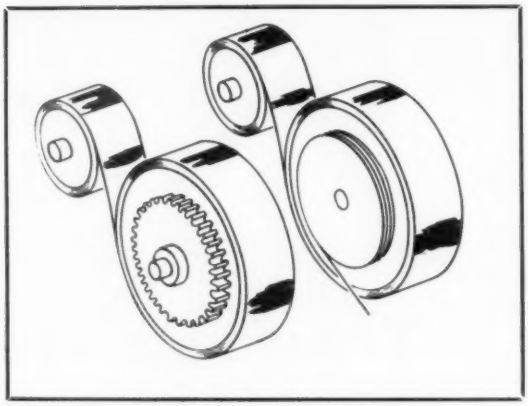


FIG. 2. CONSTANT-FORCE SPRING MOTOR made by wrapping the extended end of a constant-force spring about an output drum. The spring turns the drum with constant force as it returns.

In its motor form, the spring coil is mounted on a bushing in the same way as the extension spring. The free end of the coil is withdrawn, reverse-bent, and wound around a larger-radius drum. As long as the drum cannot turn, it holds the spring. Releasing the output drum allows the spring to recoil and turn the drum. The torque is independent of the amount of coiled material. The torque is the same for any degree of windup.

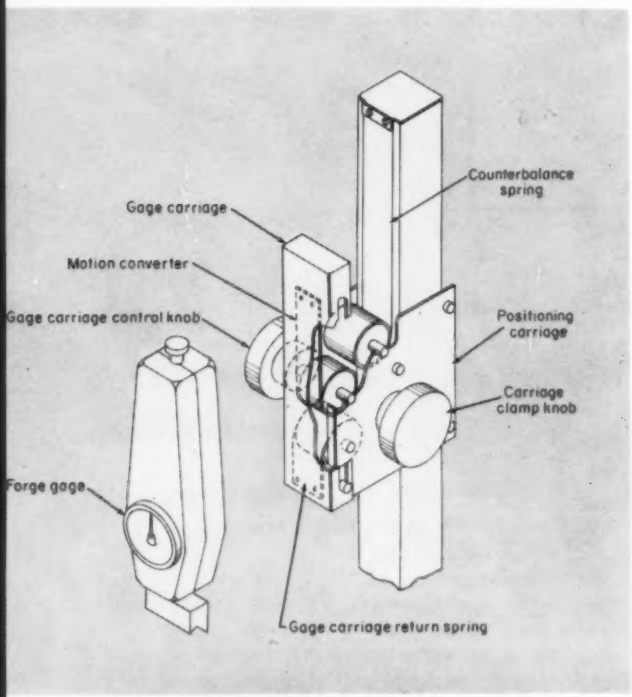


FIG. 3. THIS COMPRESSION TESTER employs Neg'ator constant-force springs instead of a rack and pinion.

Although the main purpose of the spring is to store and release energy, inventive designers have gone farther.

Gear substitute

A constant-force spring will do the work of a rack and pinion, and thereby simplify the construction of a test instrument and make it work smoother, Fig. 3. Turning the gage control knob moves the gage head in a straight line.

One spring links the control knob with the carriage. The spring is drum-mounted on the stationary positioning carriage. Turning the knob clockwise winds the extended end of the spring. This pulls the gage and its carriage downward into test position.

A second constant-force spring returns the gage head to the raised position automatically when the control knob is released. This spring opposes the first, but not enough to make the knob hard to turn.

This toothless rack travels 2 in. However, there is no limit to the distance it could travel, given the space.

A third constant-force spring counterbalances all the moving components of the instrument. The third spring is mounted on the adjustable positioning carriage. Its extended end is secured near the top of the column. Normally, the friction of the locking knob will hold the positioning carriage in place. If the knob is not locked, the spring will slightly overbalance the positioning carriage, including the gage and gage carriage, mounted on it. The entire assembly will drift to the top of the column.

Automatic carriage-return springs

Many business machines and scanners contain devices that have to move back and forth repeatedly. Example: Typewriter carriages. The designer must find a way to retract the carriage, or other device, to its initial position.

Over long ranges of travel, conventional power

springs and extension springs might take too much space and vary too much in force. Constant-force springs, however, have been found useful for the job.

A constant-force spring operates the 14-in. scanning carriage of a facsimile transmitter, Fig. 4. Western Union Telegraph Co. designed it. The spring is 0.004 in. thick, ¾ in. wide, and 20 in. long. It supplies a constant force of 0.65 lb. Its outer end is fastened to the scanning carriage. The band is coiled on a free-turning spool mounted on the transmitter frame. The spool is only 1 3/16 in. long and 3/4 in. in diameter. This constant-force spring unit takes far less space than a conventional power or extension spring.

As the scanning carriage travels, it pulls the spring off the spool. When the carriage drive stops, the spring recoils on the spool and pulls the carriage back.

Tests show that an extension spring of reasonable size could not do the job. It would accelerate the carriage too much at maximum carriage excursion. This, in turn, would put too much force on it. A constant-force spring returns the carriage gently.

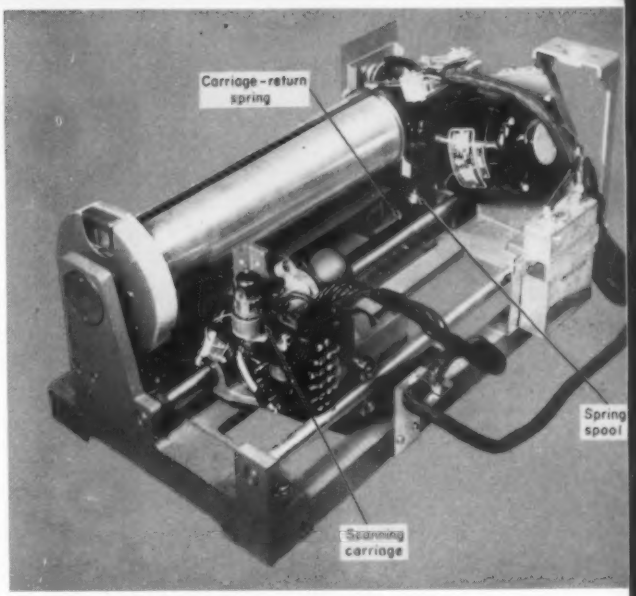


FIG. 4. THIS FACSIMILE TRANSMITTER has a constant-force spring to retract the scanning carriage without overloading the driving mechanism when the carriage is at end of its run.

Mechanical linkages

Power-transmission engineers are constantly striving to improve mechanical linkages for transmitting intermittent motion. They also would like to cut costs. Constant-force springs can help. For example, they are fine in the linkage between the timing drive and the paper-handling rollers of a printing press, Fig. 5.

A good press should print in register throughout a long operating life. The constant-force spring maintains this accuracy. The spring synchronizes and links the action of the paper-handling rollers to the timing assembly. It does not wear (as do gears) or stretch (as do cables).

The ribbon-like stainless-steel spring coils tightly around the roller drive pulley. Its free end is fastened to the cam-and-lever-driven timing segment. When the driving members oscillate, they pull the spring from its pulley. The pulley rotates at the proper instant and through the correct angle for handling each sheet of paper passing between the roller pairs. A constant-force spring motor on the opposite roller hub returns the rollers to starting position for each cycle.

The small mass of the spring, as compared to gears necessary to do the same job, puts a smaller load on the driving members. This cuts down the wear of these constantly accelerating and decelerating components.

The spring requires fewer component parts and less precision machining. It is less costly, and operates more quietly than gear-train linkages. Also, it requires no maintenance or lubrication.

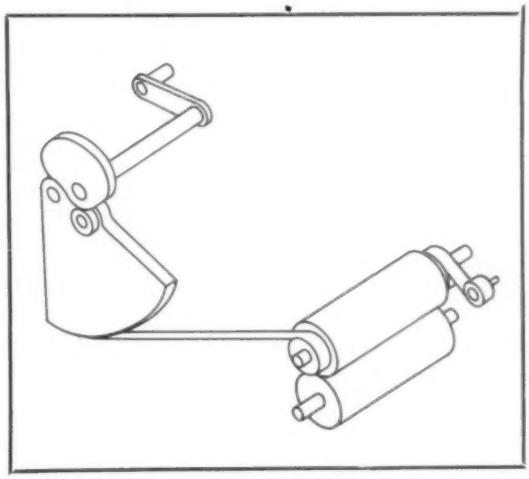


FIG. 5. EXTENSION FORM of constant-force spring links oscillating drive with feed rollers in a printing press. Constant-force spring motor at opposite end of rollers returns the rollers to starting position for each cycle.

Antibacklash applications

A spring motor retracts the instrument cable of a displacement transducer, Fig. 6, without backlash. This transducer measures the deflection of structural members during dynamic load tests.

When the structure deflects, it pulls the stranded-steel cable of the transducer, turning the reel on which the cable is wound. Rotating with this reel is the wiper arm of a precision, 10-turn potentiometer. It measures the displacement electrically. Four spring motors produce a restraining torque on the reel, keeping the cable taut with a constant 1-lb force.

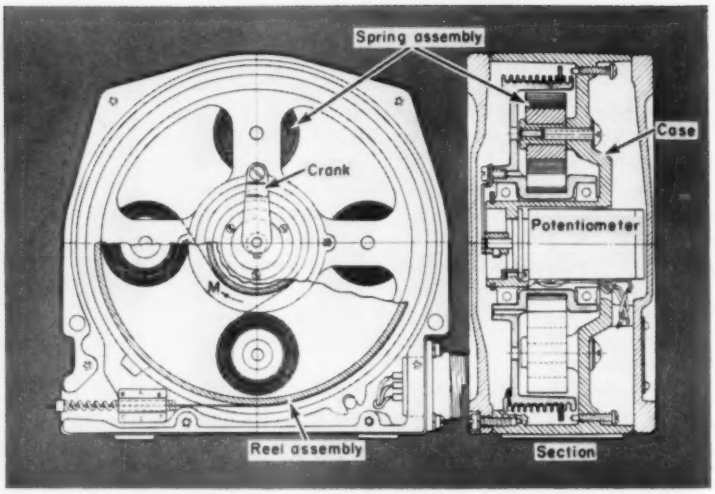


FIG. 6. FOUR SPRING MOTORS mounted about the axis of the cable reel of a displacement transducer. They apply torque to the reel. This torque keeps the cable in tension and prevents backlash when the load is removed and the cable is rewound. The shaded area (the reel and its drum) in the sectional view rotates about the central axis. The cross-hatched area remains stationary except for the four motor bushings which rotate freely.

As the load is removed, the spring motors rewind the cable on the reel without backlash.

When powered by constant-force spring motors, the reel is capable of a greater number of turns than would be possible with conventional spring loading. This reel can make 10 turns without building up the restraining force.

One turn of the reel equals 1 ft of cable extension. The maximum deflection is 10 ft. If a conventional spring motor were used, force buildup would be considerable. This would probably inhibit the response of the potentiometer and distort the measurement of the amplitude and frequency of displacement of the tested member. ◆

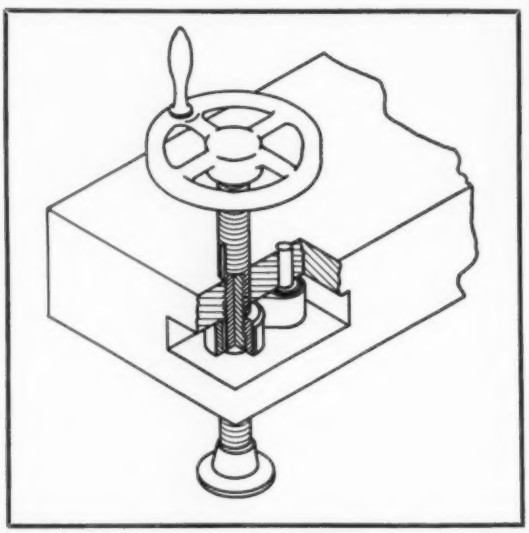


FIG. 7. OUTPUT TORQUE of a constant-force spring motor in a screwjack. Without the torque of the spring motor, manual operation of the jack would have called for a larger hand wheel to provide a longer lever arm and additional mechanical advantage.

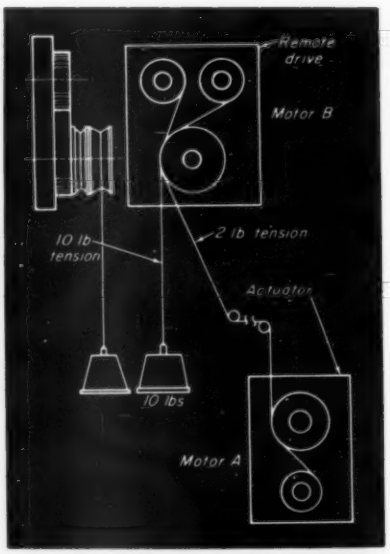
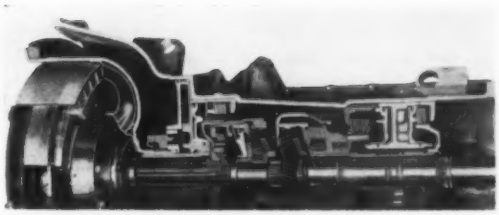
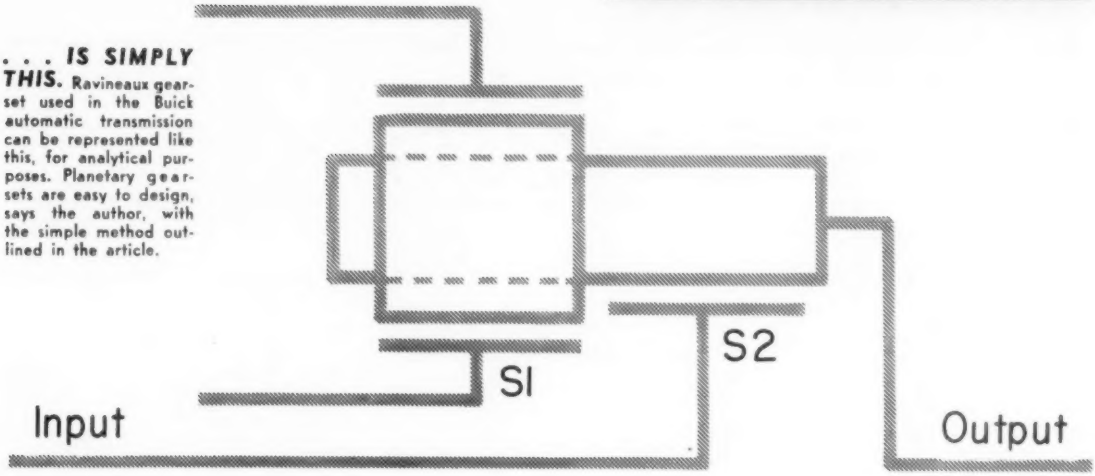


FIG. 8. TWO CONSTANT-FORCE SPRING MOTORS make an inexpensive, but practical, servomechanism. Motor A, with a 2-lb cable tension, is a manually operated actuator. Motor B is connected to Motor A by a cable that runs from the output spool of one motor to the output spool of the other motor.

Motor B is at a remote location and provides a 12-lb force. Of this force, 10 lb supports the 10-lb load while the other 2 lb balances Motor A. Friction keeps the system static until Motor A is manipulated. When Motor A is operated in either direction, Motor B follows. If the only load on Motor B is an indicating function, both motors can have equal cable tension.



ALL THIS . . . Gear train in the latest model Buick automobile, is the most advanced train design in the automobile industry. Space required for the gear train is very small. The train itself connects two axial flow turbines to give two forward gear ratios and reverse within the same set.



. . . IS SIMPLY THIS. Ravineaux gearset used in the Buick automatic transmission can be represented like this, for analytical purposes. Planetary gearsets are easy to design, says the author, with the simple method outlined in the article.

Planetary gear trains— where and how to use them

By **OLIVER K. KELLEY,** *Technical Asst. to General Manager, Defense Systems Div. General Motors Technical Center, Warren, Mich.*

ALMOST ALL HEAVY-DUTY AUTOMATIC TRANSMISSIONS use planetary gears. Important reasons: planetary gear trains are less bulky, have higher efficiencies, better bearing locations, and are quieter than countershaft gears.

Space saving

Planetary gear trains are more compact than countershaft gear trains. An entire planetary train occupies only one gear width, plus a small addition for the carrier flanges. Countershaft arrangements, on the other hand, must be longer because they use side-by-side input and output gearsets and bearings.

Furthermore, planetaries provide three or more meshing gearsets arranged around the input gear. Even though planetary gears must operate with lower stresses because more than one gear is in meshed contact with the input gear, the multiple pinion arrangement considerably lessens tooth loads. Narrower gears are the result.

Planetaries also eliminate the radial load-carrying bearings. There is no radial load on either input, or output, shaft. Each pinion does carry a radial load, but the bearings for these are located directly under the load on the pinion shafts. The sole spatial disadvantage of the planetary gear is a possible increase in radial dimensions.

Efficiency higher

A fixed countershaft has two sets of gears transmitting the full power and suffering the sliding loss

of the involute gear twice. Planetary gear trains handle only differential power. **Input gear** loss is in proportion to input speed minus output speed multiplied by input torque. **Reaction gear** loss is proportional to output speed multiplied by reaction torque.

By comparison, the two losses of a countershaft system are: **input gear train** loss in proportion to the input speed multiplied by input torque, and **output gear train** loss proportional to the output speed multiplied by output torque. The gain for the planetary system becomes substantial especially where the planetaries have small speed reduction ratios.

Planetaries are more efficient also, because they have smaller bearing losses. The bearing P-V values are a direct reflection of the gearing P-V values. The advantages of planetary gear design over counter-shaft designs are of the same general order in bearing P-V losses as they are in gear tooth action losses.

Quieter, Too.

In countershaft gearing there is no helping factor to keep pitch line velocities low. The driving gear diameter is determined by tooth loads. This, in turn, unavoidably sets the pitch line velocity. With planetaries, the planet carrier's rotation can reduce the gear's pitch line velocity considerably. Also, because of the multiple pinion arrangement, planetary gear trains have a smaller diameter driving gear.

A further important factor is the shaft support bearing. In countershaft designs these bearings may be very large and expensive. This difficulty is avoided in planetary gears, where the only bearing loads are on straddle-mounted pinions directly on the pinion's shaft. As long as the carrier is torsionally rigid, there is little difficulty in aligning the gears.

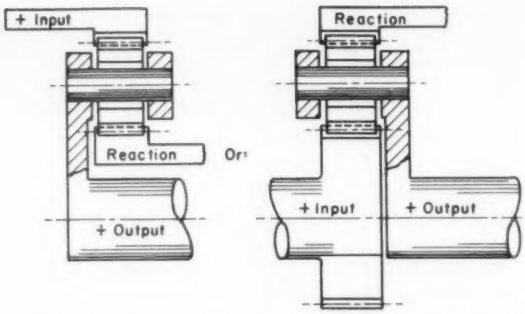
Design limitations

While reduction ratios of 3:1 or greater are easily designed in a planetary system, good designs are difficult when the reduction ratios are less than 2.8:1. The pinions become very small, the number of teeth less than 15. There are difficulties in modifying the teeth, and the space left for the bearing becomes minute. If, alternatively, the ring gear is used to drive and the sun gear is the reaction member, the trouble point of a small pinion shows up with reduction ratios of 1.5 or more. The ring gear input reduction gear can grow embarrassingly large when the designers try to use reduction ratios of less than 1.35:1. Generally, the reaction sun gear must be large enough to permit the output shaft to run through it. This also determines the size of the ring gear.

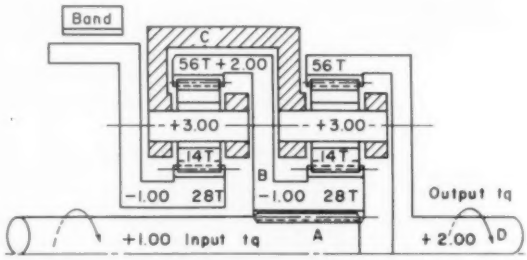
In the ultimate conditions of ratios available, it becomes impossible to obtain a 2:1 ratio with either the sun gear driving or the ring gear driving. This is where compound planetaries are used.

Number of pinions, teeth

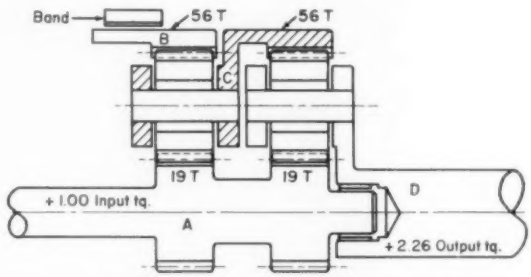
Less than three pinions are seldom worthwhile. More than three are often used. Four and six planetary gear trains are found in many automatic trans-



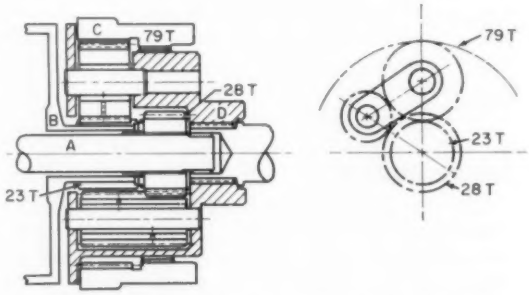
A CLASSIC 3-ELEMENT SIMPLE PLANETARY GEAR TRAIN. It consists of three concentrically placed elements. The reaction member must be held stationary when the train is used for reduction. When the system is used for a 1:1 direct drive, the reaction member can be clutched to the input member.



A COMPOUND GEAR TRAIN giving a 2:1 forward reduction. This is a regenerative design application.



ANOTHER COMPOUND GEAR TRAIN, this on load dividing, and again with a 2:1 forward reduction. This case is used for the first example of the Simple Design analysis.



A COMPACT DESIGN that can be used for almost 2:1 reduction ratios, is the Ravigneaux. It has the advantages of requiring only a single carrier, and keeps the pitch line velocities of the gears low. This system is used for the second example of the Simple Design analysis.

ANALYSIS 1

	A	B	C	D	STEP 4 REDUCTION RATIOS FORWARD	REVERSE
STEP 1	+ 1.00	− 1.2174 = $\frac{28}{23}$	+ .3544 = $\frac{28}{79}$	0	$\frac{A}{C}$ = 2.821 to 1	$\frac{B}{C}$ = 3.435 to 1
	− .3544	− .3544	− .3544	− .3544		$\frac{B}{A}$ = 1.2174 to 1
STEP 2	+ .6456	− 1.5718	0	− .3544	$\frac{B}{D}$ = 4.435 to 1	$\frac{B}{A}$ = 2.434 to 1
	+ 1.5718	+ 1.5718	+ 1.5718	+ 1.5718		$\frac{A}{D}$ = 1.821 to 1
STEP 3	+ 2.2174	0	+ 1.5718	+ 1.2174	$\frac{A}{C}$ = 1.410 to 1	
					$\frac{A}{D}$ = 1.821 to 1	
	− 2.2174	− 2.2174	− 2.2174	− 2.2174	$\frac{C}{D}$ = 1.291 to 1	
STEP 3a	0	− 2.2174	− .6456	− 1.00	$\frac{B}{C}$ = 3.435 to 1	
					$\frac{B}{D}$ = 2.2174 to 1	
					$\frac{D}{C}$ = 1.549 to 1	

ANALYSIS 2

	A	B	C	D	STEP 4 REDUCTION RATIOS FORWARD	REVERSE
STEP 1	+ 1.00	− .3393 = $\frac{19}{56}$	0	+ .2533 = $\frac{19}{75}$	$\frac{A}{D}$ = 3.947 to 1	$\frac{A}{B}$ = 2.947 to 1
	− .2533	− .2533	− .2533	− .2533		$\frac{B}{D}$ = 1.34 to 1
STEP 2	+ .7467	− .5920	− .2533	0	$\frac{B}{C}$ = 2.337 to 1	$\frac{A}{B}$ = 1.261 to 1
	+ .5920	+ .5920	+ .5920	+ .5920		$\frac{A}{C}$ = 2.947 to 1
STEP 3	+ 1.3387	0	+ .3387	+ .5920	$\frac{A}{C}$ = 3.947 to 1	
					$\frac{A}{D}$ = 2.26 to 1	
	− 1.3387	− 1.3387	− 1.3387	− 1.3387	$\frac{D}{C}$ = 1.747 to 1	
STEP 3a	0	− 1.3387	− 1.00	− .7467	$\frac{B}{C}$ = 1.3387 to 1	
					$\frac{C}{D}$ = 1.3387 to 1	
					$\frac{B}{D}$ = 1.793 to 1	

missions. Production machinery can easily bore pinion shaft-locating holes accurately enough to produce actual load sharing for all pinions.

Simple rules govern the number of teeth in the sun and ring gears and the pinion center location. If equal addendum-dedendum tooth proportions are used, numbers of teeth on sun and ring gears must be either both even or both odd. Each simple planetary has locations where the pinions will mesh with the sun and ring gear simultaneously. The number of locations

equals the combined number of sun and ring gear teeth.

The pinions must mesh in increments of the least mesh angle in order to assemble both the sun and ring gears.

The least mesh angle for a simple planetary gearset is:

$$\frac{360^\circ}{R + S}$$

where:

R = Number of teeth in ring gear

S = Number of teeth in sun gear

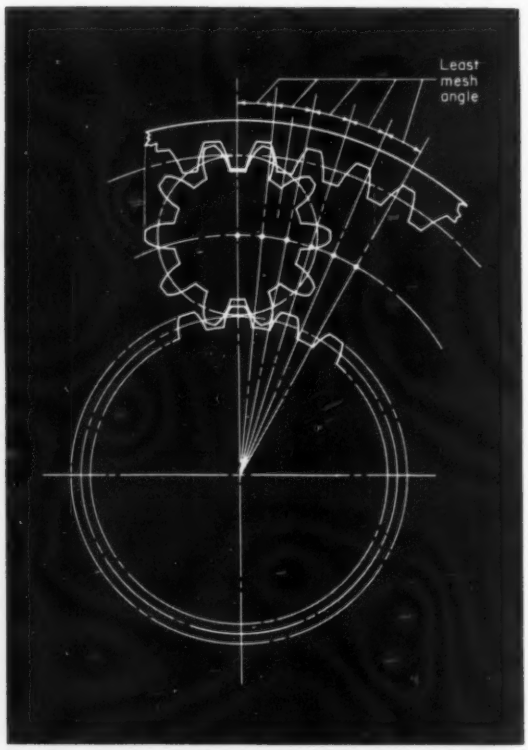
In order to have evenly spaced pinions, the angle between them must equal:

$$\frac{360^\circ}{N}$$

where: N = Number of pinions to be used

Then, for evenly spaced pinions, this angle must be an integral multiple of the least mesh angle, or:

$$\frac{\dfrac{360^\circ}{N}}{\dfrac{360^\circ}{R + S}} = \text{Whole number}$$



NUMBER OF PLANETS depends on the least angle that can be maintained between them. Assume the planets can turn freely about the sun gear. Then minimum angular separation of the planets is shown when the teeth would remesh with the ring gear teeth. This separation angle is different for same-direction rotation of the sun and ring gears, and for opposite-direction rotation.

A simple method for calculating compound planetary ratios

The number of possibilities of compound planetaries of two or more trains is almost infinite. There is an easy way of computing these ratios. Simple planetary ratios are so easy to compute that they need little mention. When the ring gear is driving, the ratio equals the sun plus ring divided by the ring. When the sun is driving, the ratio equals sun plus ring divided by sun. In other words, take total number of teeth in the planetary's sun and ring gear, and divide by number of teeth in the driver.

When regenerative and other phenomena occur in the train, the designer can spend much time analyzing possible planetary arrangements. The full potential of any gear train is fully revealed by this method:

- *Hold any member of a gear train, turn any other member one revolution. Record the speed for each rotating member of the train when the speed of the member held is zero. The resulting figures are the speeds of all gear train members.*
- *Choose any of the rotating members for the next possible stationary member. Add an equal quantity of opposite sign to it's speed value. Therefore its speed value is now zero.*
- *Add this same quantity to all members' speed values determined in the first paragraph. This gives the original arrangement's zero members a definite speed value, and changes all other speed values.*
- *Repeat this procedure until every member, in turn, has been equated to zero.*
- *Examine the potential speed relations of the gear train for usable ratios.*

or:

$$K = \frac{R + S}{N}$$

For a double pinion gearset:

$$\text{Least mesh angle} = \frac{360^\circ}{R - S}$$

For evenly spaced pinions, whole numbers:

$$K = \frac{R - S}{N}$$

For a long and short pinion meshing with two sun gears:

$$\text{Least mesh angle} = \frac{360^\circ}{S_1 + S_2}$$

For evenly spaced pinions whole number:

$$K = \frac{S_1 + S_2}{N}$$

The Ravigneaux planetary set with a ring gear mounted to the large pinion must meet all of the foregoing formulas. If the requirement for a double sun and a double pinion is met, then the requirements for a simple planetary set is met.

Note on bearing problems

Bearing problems are rare in planetary gear design; one which has occasionally arisen results from the widespread use of needle bearings.

A relatively flexible needle bearing trying to roll on a deflected-at-the-middle shaft and on the inner surface of the rigid pinion bore does not behave like a true roller bearing. High helix angle thrust loads impose a sizeable cocking couple on the bearing. This loads the sides of the shaft in a spiral pattern, and can impose high end thrusts on the roller. These end thrusts need to be carefully considered for thrust washer design and lubrication.

High speed designs reveal bearing problems not encountered in passenger car transmissions. When the planet carrier increases in size, or speed, centrifugal force on the pinions and on the bearings increases, too. The bearing load pattern shifts toward the underneath portion of the pinion shaft.

At the underside of the shaft, where the bearing load is carried, the rollers rotate as they should. But as the rollers roll out of the loaded area, the high centrifugal force tends to increase their speed toward the top, and retard their travel to the bottom. The entire stack of rollers tends to accumulate at the top side. Because they are tightly packed against one another, these top rollers tend to lose their rotational speed. When they enter the working part of the path, they have to be re-accelerated to the full rotational speed. It is very much like the wheels of a jet 'plane hitting the landing strip, and all that can save them is plenty of cooling oil.

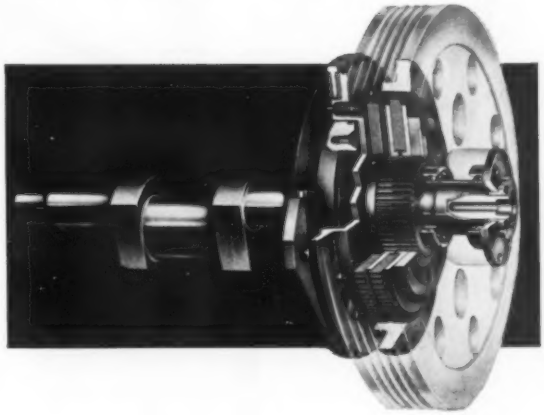
Torque requirements and the clutch

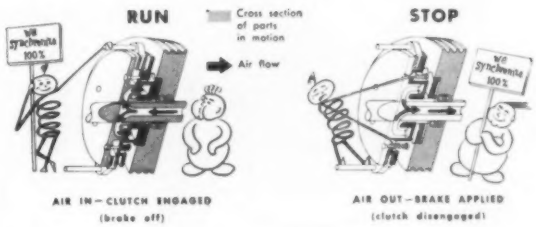
Ratio changing necessitates a clutch, and the location of the clutch within the gear system can be very important. Regardless of the clutch location, it will be required to absorb the same number of Btu's during a given shift.

But, the clutch torque is in inverse proportion to the speed difference between the clutched elements. So the torque capacity of the clutch is determined by the inertia of the power plant and connected masses, and the clutch's share of the driving torque at the time of the shift. The torque capacity of the clutch should be limited, so that the inertia torque pulse is no more than 1/3 of the powerplant output torque. Pulses greater than this value give shifts that are rough, and give the driver an unpleasant sensation.

In a simple planetary set, with torque reduction of 3:1, a clutch between input and reaction members needs 0.667 times the input torque. Clutching between reaction and output members will require 2 times the input torque. This is three times the capacity of the first case, although the same amount of heat is dissipated in each case. ◆

To Increase Press Efficiency





MINSTER Clutches for Press Conversions

A Minster Clutch conversion is the most profitable way to increase press efficiency because it will

- eliminate downtime caused by clutch failure
- reduce maintenance and parts replacement
- increase die life
- reduce operator fatigue
- improve safety and increase production

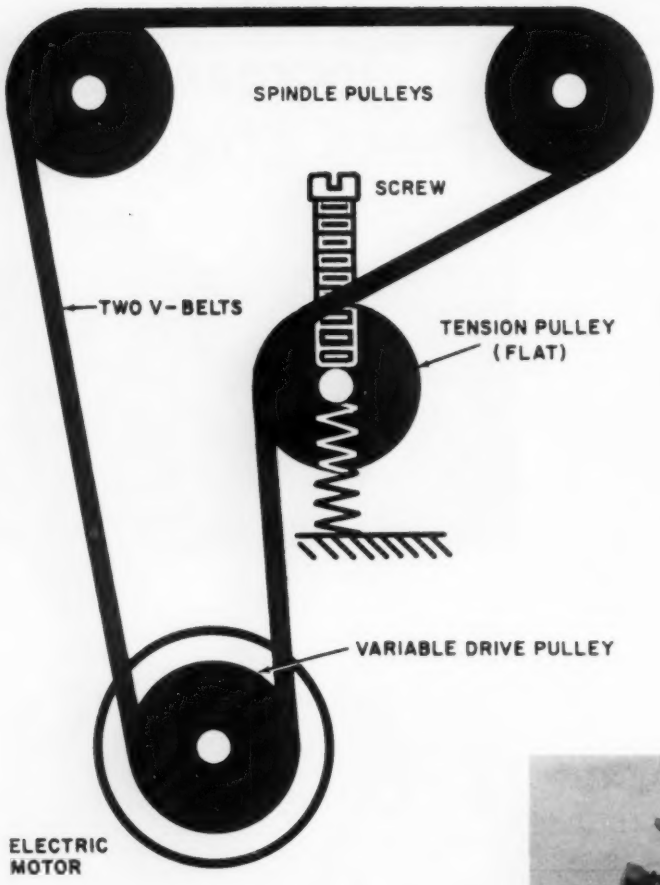
Minster conversion units, *made by a press manufacturer who knows your problems,* are standard clutches individually applied to your press. Complete with flywheel and shaft, ready to drop into place. Thousands in daily use.

Write for Clutch Conversion Booklet CC57

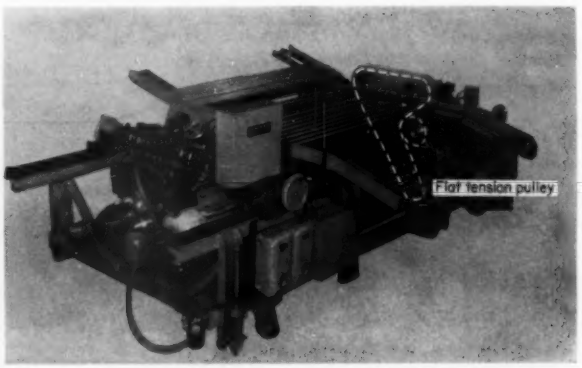
THE MINSTER MACHINE COMPANY • MINSTER, OHIO

MINSTER®

Circle 28 on Reader Service Card



Flat pulley is V-belt speed control

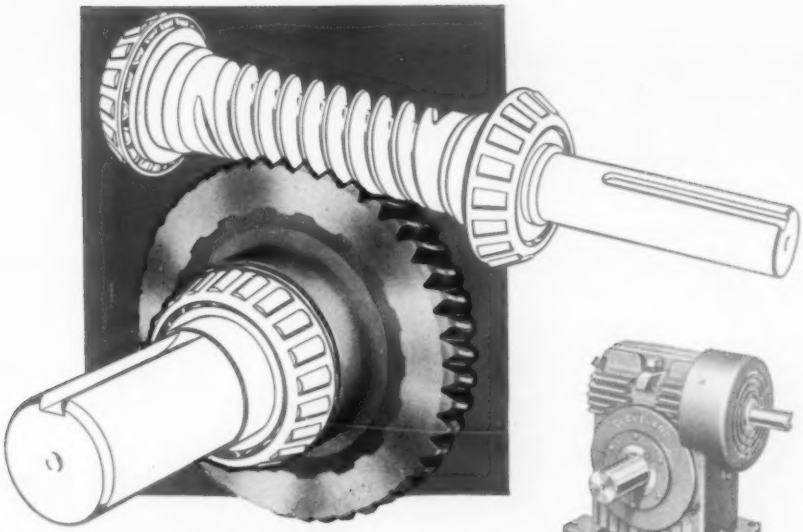


END ROLLING MACHINE from Automation Design & Machinery Co., New York, has unusual speed control. This tandem model can vary speed easily for different tube sizes.

AFTER METAL TUBING has been formed and cut, the ends are rolled to get a perfect cylindrical shape. To be versatile, an end roller must handle various tube diameters and lengths. The best turning speed depends on material dimensions as well as composition, so a simple way of adjusting the roller spindle speeds is needed.

Automation Design & Machinery's end rollers are mostly tandem models, where two tubes are rolled at the same time. To make sure they have the same speed, they are usually powered by a single motor. The motor drives a spring-loaded variable pulley. Two V-belts ride under the variable pulley, pass over a flat pulley, and go over the tops of two roller spindles.

This arrangement is the basis of an unusual speed variation method. The shaft of the flat pulley mounts on a screw. Turning the screw raises or lowers the pulley. This changes the pitch at which the belts engage the sheaves of the variable pulley, and thus the spindle pulleys' speed change. This technique is generally frowned on by designers, but A. D. & M. has already built a dozen machines using it, with no trouble at all. ◆



for longer trouble-free service life

...New Higher Horsepower Cleveland Speed Reducers feature centrifugally cast bronze gears

Providing higher input horsepower and output torque ratings, *New* Cleveland Speed Reducers now give industry dependable speed reduction at savings of 50% or more on per horsepower cost—without increasing size of the units.

Playing an important role in helping achieve these improved new ratings are Cleveland's centrifugally cast bronze gear rims of a high copper-tin-nickel alloy. When properly cast, this material provides highest strength compatible with requirements that it be free from abrasive crystalline components. Yet it's yielding enough to avoid excessive loading stress localization, while affording a low coefficient of friction against hardened steel—providing increased resistance to wear and fatigue pitting.

These rugged bronze rims are cast integrally with their supporting cast iron hubs (see photo at right). Checkered hub circumference holds the rim securely in position, making the two members independent of actual surface bond.

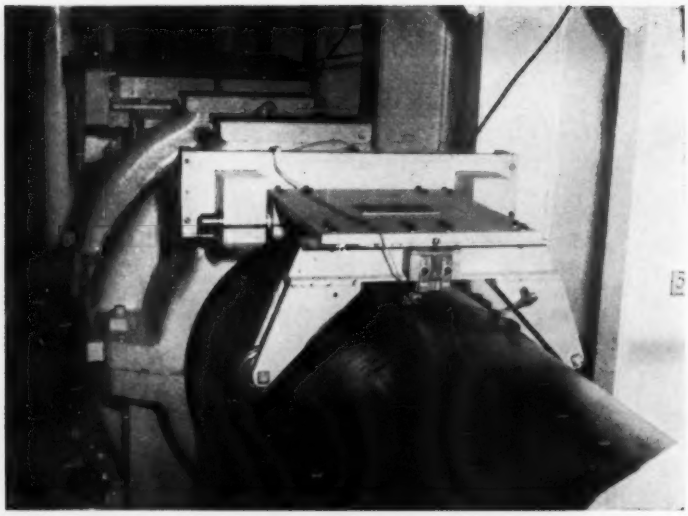
Also, another plus value of the New Cleveland Reducers is their especially large gear shaft diameters—which provide greatly increased overhung load carrying capacity.

For complete facts on this New Cleveland Speed Reducer Line, consult your local Cleveland Representative. Or, write us direct for free Bulletin No. 405—it gives *complete* engineering information for designers and engineers.

CLEVELAND
Worm Gear
Speed Reducers

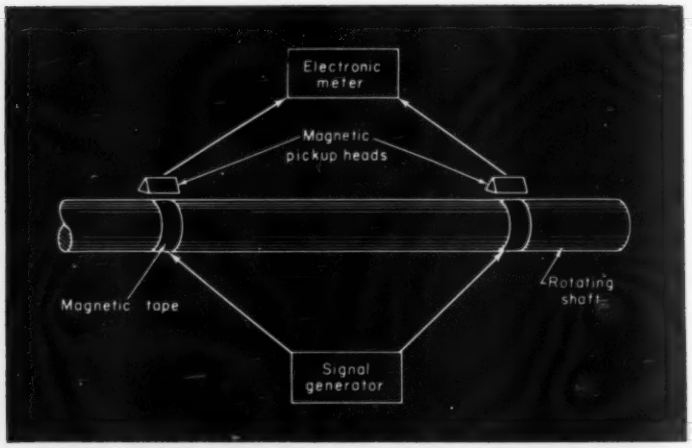
Cleveland Worm & Gear Division
Eaton Manufacturing Company
3282 East 80th Street • Cleveland 4, Ohio

Circle **13** on Reader Service Card



HORSEPOWER generated by the main power shaft of a steamship is determined by a new electronic device.

Check hp with magnetic tape



ELECTRONIC SYSTEM is composed of a signal generator, two magnetic media, two magnetic pickup heads, and an electronic meter. Signal generator applies reference frequency to magnetic tapes when shaft rotates at no load. When load is applied to shaft, magnetic heads pick up phase relations of induced voltages and transfer them to the electronic meter. The meter computes rpm, torque and hp.

A NEW ELECTRONIC DEVICE can directly measure power transmitted through a rotating shaft. There is no need to modify the shaft.

The device measures magnetically the torsional deflection and rotational speed of the shaft. Then the device multiplies the two measurements electronically to give horsepower.

Sierra Research Corp., Buffalo, developed this device. It will measure small or large horsepower, providing that the power-transmitting shaft is substantially stressed and that sufficient amount of shaft is available for measuring torsional deflections.

Engineers used one of these devices to measure the horsepower generated by the main power shaft of the steamship *Mormacpride*. The shaft has a diameter of 22 in. and transmits up to 20,000 hp. The same device can be used on a power system that transmits ¼ hp or less from a ½-in. diameter shaft. The device will go months on end without any maintenance.

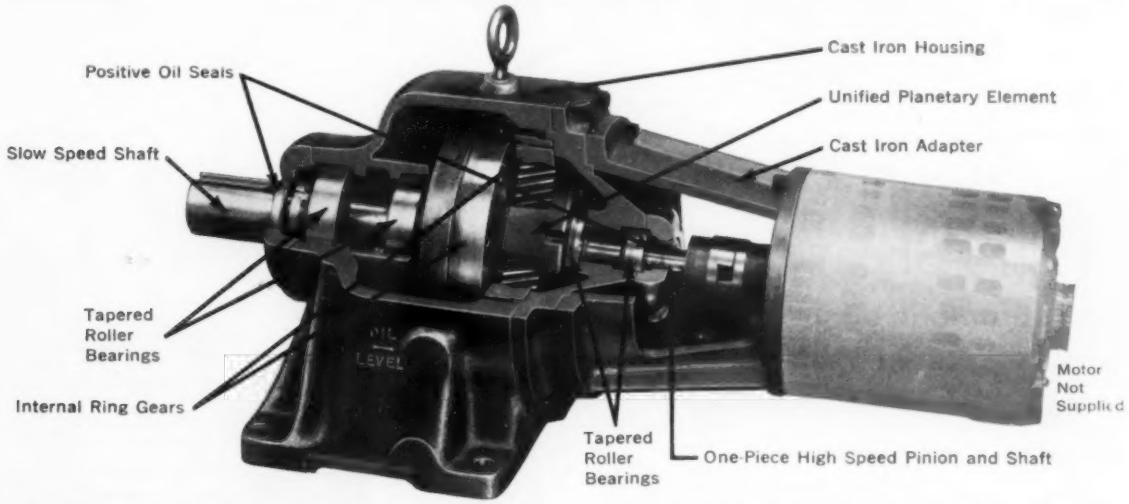
The electronic portion is transistorized. Torque, speed, and horsepower are displayed on meters, and are also available as analog voltages.

To measure horsepower, technicians bond two magnetic media (such as tape or oxide) around the shaft. Then they record a reference frequency on the magnetic media while the shaft is rotating at no load. When

Engineering Data

WINSMITH SPEED REDUCERS

HORIZONTAL MOTORIZED DIFFERENTIAL SPEED REDUCERS



CAST IRON HOUSING—designed for high heat radiation. One-piece construction, close-grained gray iron for maximum strength and rigidity.

UNIFIED PLANETARY ELEMENT—integral primary and secondary planetary gears, mounted in a ductile iron cage—for even wear, equalized load, smooth operation. Hardened and ground, alloy steel gears carry entire power transmission load.

CAST IRON ADAPTER—permits use of any standard "C" flange motor. Flexible coupling (optional) connects motor to input shaft which can be driven in either direction.

INTERNAL RING GEARS—primary and secondary. Cut from alloy steel, heat treated for wear resistance.

ONE-PIECE HIGH SPEED PINION AND SHAFT—machined from alloy steel with teeth cut integral with the shaft. Hardened and accurately ground to close limits.

SLOW SPEED SHAFT—heat treated, precisely ground alloy steel. Low speed gear web of ductile iron.

TAPERED ROLLER BEARINGS—opposed pairs support the radial load, take thrust, ensure permanent alignment of both input and output shafts.

POSITIVE OIL SEALS—chevron type, keep oil in, dirt out. Oil and heat resistant, non-abrasive, low coefficient of friction.

AVAILABLE in any ratio from 1.1:1 to 50,000:1 without increasing the number of parts. Each model has a range of reduction ratios. Overall dimensions of individual models do not change regardless of ratio.

- *7 Models*
- *.12 to 81.51 H.P.*
- *Ratios 1.1:1 to 50,000:1*
- *Max. Output Torque 50 to 113,000 in. lbs.*

Series HM Horizontal Motorized Speed Reducers are a part of the Winsmith Planetary Differential Reducer line. They feature cut-tooth helical gears of 15° helix angle for smooth, positive power transmission—greater load carrying capacity—larger reduction ratios in smaller, more compact units—minimum wear and long service life. Winsmith Horizontal Motorized Differential Reducers are easy and convenient to install, require no bedplate, deliver more horsepower per pound of weight and cubic foot of space, and permit easier integration with the driven machine.

Write today for complete information or call your nearest Winsmith Representative listed in the Yellow Pages. He is a technically trained expert who is always ready to help you with any speed reducer problem. For both standard and special power transmission applications, you'll find it pays to standardize on Winsmith.

WINSMITH, INC.

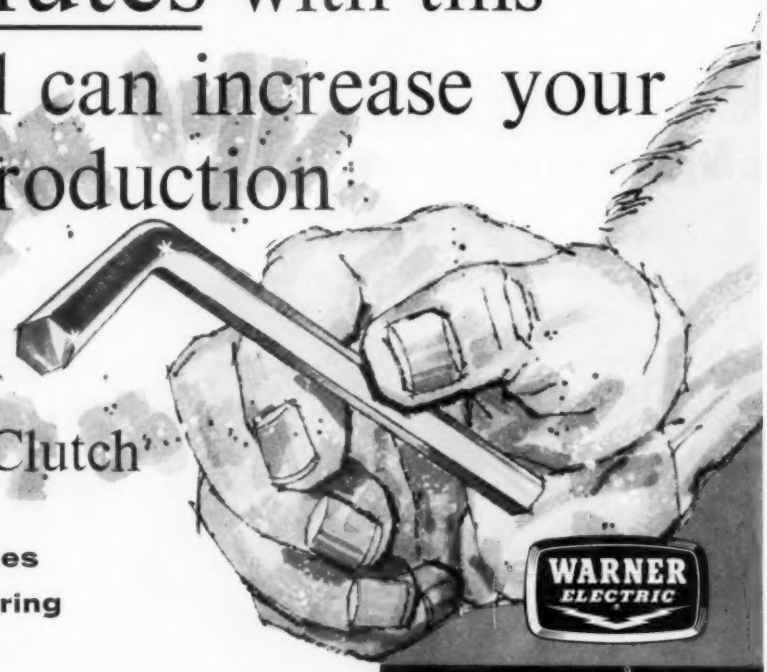
204 Eaton Street, Springville, (Erie County), New York

MEMBER OF AGMA

• • • Winsmith Speed Reducers are made by American craftsmen to meet American design and production standards.

Circle **46** on Reader Service Card

ten minutes with this simple tool can increase your machine production

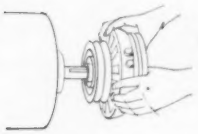


New Warner Electro-Sheave Clutch

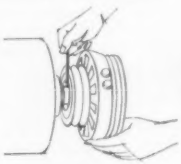
puts automatic control on your present machines without special engineering or machining

Now you can put automatic cycling, pushbutton jogging on practically any machine — in a way that will amaze you! You begin with a familiar Allen key — and without expensive engineering, without machining or tooling of any kind — you upgrade and modernize your present machines. See what a difference automatic control can make in increased production, reduced maintenance.

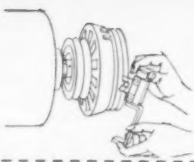
In just ten minutes your Warner distributor can show you how simple it is to install an Electro-Sheave Clutch on any of your machines. Call him today — or mail coupon below.



1 Entire assembly slips over any motor or driven shaft. No machining necessary.



2 With clutch-sheave package in place, setscrews secure built-in shaft extension.



3 Mount brushholder to machine frame, wire to control. Electro-Sheave is ready!

WARNER ELECTRIC

Warner Electric Brake & Clutch Co., Dept. PTD-6, Beloit, Wisconsin

I'm interested in your new Electro-Sheave Clutch.
Rush me details today.

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

This new brochure gives you all the facts!

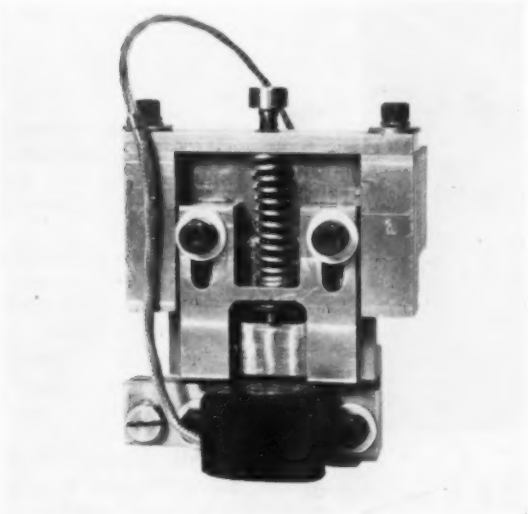
Complete cutaway drawings, selection charts, installation details on Warner's new Electro-Sheave Clutch. Get your copy *now*.

Stocked by Distributors in Principal Cities Throughout the World

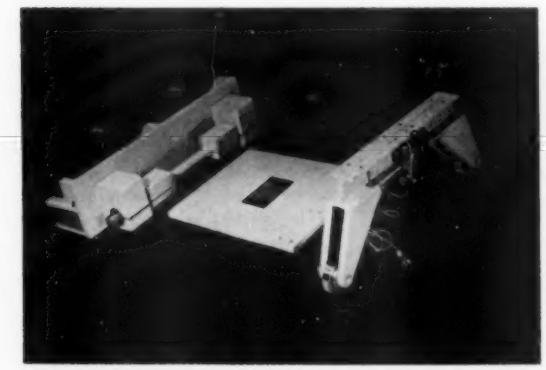
Circle **45** on Reader Service Card

load is applied to the shaft, magnetization on these media induces voltage in two magnetic pickup heads.

Phase relations of the induced voltages provide a measure of the angular twist (torque) of the shaft. Frequency of the induced signal provides a measure of the shaft speed.

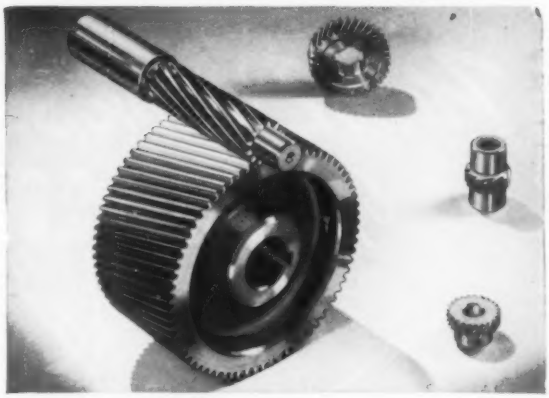


MAGNETIC PICKUP ASSEMBLY contains an adjusting mechanism to neutralize the effects of vertical and lateral motion of shaft.



FOLLOWER ASSEMBLY is divided into three basic components. Magnetic pickup assembly is shown already installed in carriage assembly.

The magnetic heads are mounted on carriages that ride on the shaft. These carriages, called shaft followers, follow the vertical and lateral motions of the shaft—but not the twist. The phase of the voltages induced in the two magnetic heads is proportional to the twist in the shaft, and is independent of shaft position, bending, and flexing. ◆



Helicals and Spiral Gears—precision-made of any material—with famous G.S. uniformity!

Whatever basic material your application calls for, Gear Specialties can give you Helicals and Spiral Gears of consistently superior quality, made with the precision for which G.S. is famous. That means your production isn't slowed down by rejects or imperfections—and your product will perform smoothly and efficiently in the hands of your customers.

It's this unvarying G.S. quality—backed by unsurpassed experience, craftsmanship, equipment, production control—which leads top-name manufacturers in all divisions of industry to make G.S. their Number One source for not only Helicals and Spiral Gears, but for Fine and Intermediate Pitch Gearing of all types, in all quantities.

Get *your* Gear job done better—put G.S. in your picture now!

SEND FOR FREE
Small Gearing Guide. Contains useful charts. Send for your copy today!

FRACTIONAL HORSEPOWER GEARING

GEAR
Specialties, Inc.
2635 WEST MEDILL AVENUE
CHICAGO 47, ILLINOIS

SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARING

Circle **19** on Reader Service Card

bearings and parts

Take the simple, sure, direct route to lower manufacturing and maintenance cost. Design into your product Bunting Standard Stock Bearings. You avoid inventory investment, delays, confusions, production problems by the immediate availability in small or large lots, from local distributors all over America, of hundreds of different stock sizes of completely finished cast bronze and sintered bronze bearings and bars, aluminum bars and Nylon shapes.

Special design bearings not obtainable from stock can be procured immediately at low cost from Bunting fully equipped machine shops in five industrial centers. The wide range of sizes of Bunting Stock Cast Bronze and Sintered Bronze Bearings makes the alteration of a stock item to a special bearing easy and economical. Bunting Cast Bronze, Sintered Bronze, Aluminum Bars and Nylon shapes provide the materials for special requirements which cannot be made from stock bearings. Your local Bunting Distributor can arrange for such work.

A large staff of bearing engineers in the field stands ready to assist in the use of these Bunting stock products and in the designing of bearings or components for extraordinary applications. Two big, modern plants assure ample production capacity at all times for bearings and parts made from all modern metals and materials.

See Bunting's complete catalog, Sweets Product Design File 11C/BU or ask for Bunting's General Catalog, Form 158; Nylon Catalog, Form 32; Technical Handbook on Bunting Nylon, Form 33; The Technology of Bunting Aluminum, Form 46; Engineering Handbook of Powder Metallurgy, Form 1; Bunting Machine Shop Service, Form 4.

The BUNTING Brass and Bronze Company
TOLEDO 1, OHIO
BRANCHES IN PRINCIPAL CITIES

BEARINGS, BUSHINGS, BARS AND SPECIAL PARTS OF CAST BRONZE, SINTERED METALS, ALUMINUM ALLOYS AND NYLON

Circle **10** on Reader Service Card

What's in

MEMBERS OF THE AMERICAN GEAR MANUFACTURERS ASSOCIATION were given a preview of a new classification manual as early as May, 1960.

Just completed, the manual provides for the first time a system covering spur, helical, and herringbone gears in both coarse and fine pitch ranges. It is intended to be a universal tool for use by the gear designer, the manufacturer, and the user.

However, AGMA points out, the manual is not intended to cover enclosed gear units manufactured for a given speed, reduction ratio, and end application.

The manual assigns AGMA class numbers to a wide range of gearing selections. The numbers combine a dimensional quality identifying tooth element tolerances with a Material and Treatment Number. Coarse and fine pitch gears are treated separately, but —for the first time—in the same manner, and in the same book.

The quality numbers are so arranged that the higher numbers indicate the more expensive gears. Users should take care to specify the number of the lowest quality that will do the job.

Valuable information, sometimes reducing gear selection to mere chart-reading, is contained in a series of tables. Among them, the following information is presented:

- Quality number for given end applications, in every conceivable industry.
- Suitable tolerances for each quality number on runout, pitch, profile, and lead.

the new AGMA Manual for designers and users

TYPICAL EXAMPLE OF GEAR CLASSIFICATION UNDER THE NEW SYSTEM

AGMA Quality Number	AGMA Backlash Designation	AGMA Material Number Material Treatment Hardness	AGMA Class Number
Coarse, *(all quality numbers the same)*			
Runout 5 Pitch 5 Profile 5		IN-3 Carbon Steel Induction Harden 52 to 55 RC	5-IN-3
Runout 8 Pitch 8 Profile 8 Lead 8		NI-7 Nodular Iron Quench and Temper 270 BHN, min.	8-NI-7
Runout 12 Pitch 12 Profile 12 Lead 12		S-2 Stianless Steel No Treatment Hardness as received	12-S-2
Runout 7 Pitch 7 Profile 7		B-6 Aluminum Bronze Heat Treated 179 BHN, min.	7-B-6
Coarse, *(quality numbers not the same)*			
Runout 8 Pitch 10 Profile 8 Lead 8		CH-15 Alloy Steel Carburize 60 to 65 RC	8-CH-15 (except Pitch Quality 10)
Runout 11 Pitch 11 Profile 11 Lead 10		H-5 Carbon Steel Quench and Temper 285 to 325 BHN	11-H-5 (Except Lead Quality 10)
Runout 8 Pitch 9 Profile 9 Lead 8		F-12 Alloy Steel Flame Harden 48 to 52 RC	8-F-12 (Except Pitch and Profile Quality 9)
Fine			
10	C	A-4 Aluminum Bar 2024-T4 Heat Treated 120 BHN (500 Kg)	10C-A-4

- Suitable backlash range for each quality number.
- A materials and treatment designation, for metallic materials only.

The system allows for extensions and revisions to accommodate future advances in gear manufacturing technology. It represents the experience of AGMA members, and their constructive criticism in extending and completing the manual (specially the tabulation of end uses by industry) will be welcomed, AGMA reports.

Explanation of the example

The initial number under the column headed AGMA Class Number identifies the quality needed for the particular gear function, as set down in the manual. The letters following the first dash identify the material. Numbers after the second dash designate treatment, and hardness.

AGMA Class Numbers should be included in gear specifications and on drawings.

Interpretation of the last line of the table of examples:

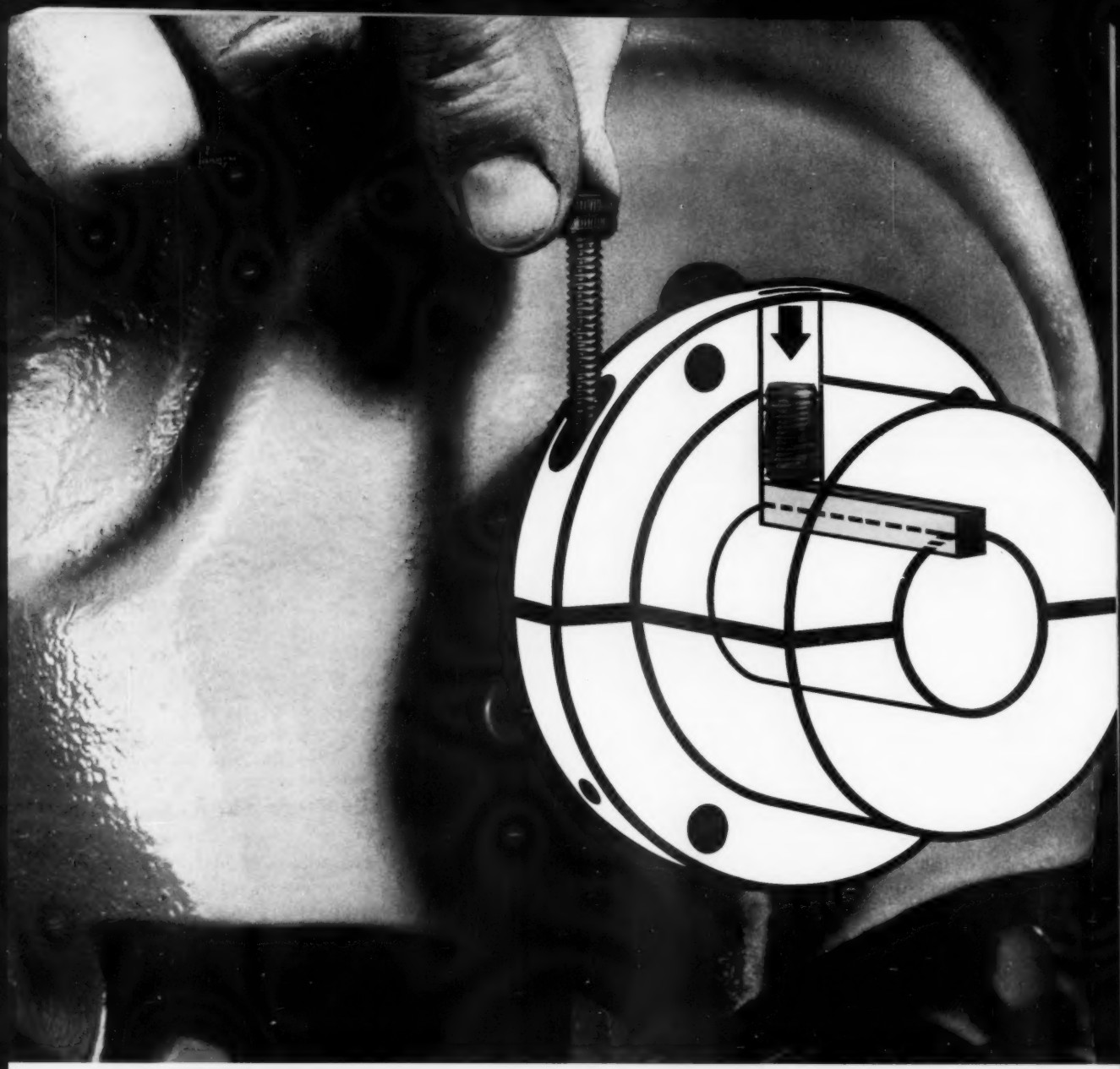
1. Consider an Aerial photographic equipment gear. It has 112 teeth, 64DP-1.75-in. PD, and requires 0.007 to 0.0015-in. backlash. It is to be made from aluminum barstock 2024-T4, heat treated to 120 BHN (500 Kg).

2. The gear will be found from the fine pitch section of the manual. In the table for end use, AGMA Quality Number 10 is indicated.

3. In the tables for fine pitch gear tolerances, look under quality number 10, and the size of gear required. Tooth-to-tooth composite tolerance and total composite tolerances are both listed, and considered acceptable.

4. In the table for backlash, the size of gear indicates the backlash designation 'C'.

5. The material and treatment tables for fine pitch gearing show the number A-4 for the material specified. ◆



HALF SAFE IS

Have you ever heard of half an accident? Frankly, we don't think so—that's why Worthington gives you double protection by building *Two* Golden Screws into every Worthington hub.

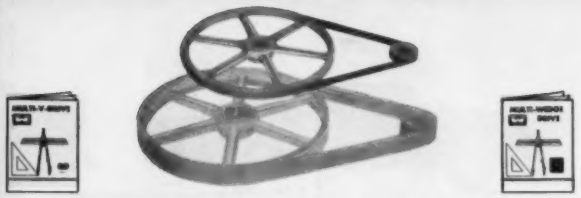
One-half the protection lies in the Golden Screw at the right, above. See how it turns down to lock the key securely in place? This prevents potentially dangerous key drift.

How important is this Golden Screw? Decide its value in light of the maximum possible danger to equipment or personnel from a loose key. And then remember this—you pay no more for this Golden Screw in a Worthington sheave. You get extra value—for the same low price.

The Golden Clamp Screw on the left, above, allows you to locate and lock the hub securely on the shaft. Locking the hub allows you to tighten the set screw without distorting the hub. It is an exclusive Worthington feature. The two piece hub and rim design simplifies installation. You install one piece at a time. You can also make sheave changes without disturbing the hub or affecting the alignment.

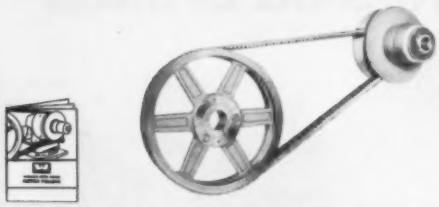
Hubs with Two Golden Screws are supplied with each of the Worthington power transmission products shown at the right. Each product has its own advantages—and all have the extra, full safety feature of the Two Golden Screws at no extra cost.

These products can work for your profit. Learn how they can be designed into your product or how they can add extra protection and performance into your plant. You can do this by asking for one or more of the "how-to-figure-it" design

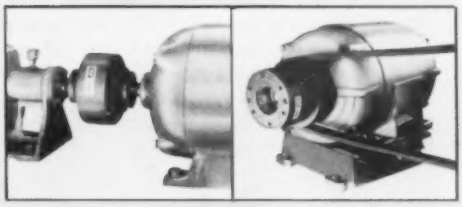


MULTI-V OR MULTI-WEDGE? Multi-V drives have been an industry standard for years. Multi-Wedge drives, using a new, stronger belt design, cut costs sharply. They reduce the number of belts, use smaller, lighter sheaves and reduce center distances.

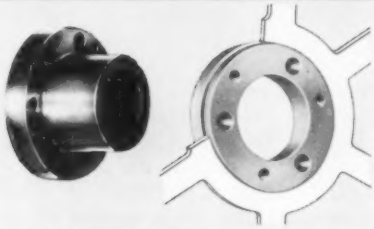
POSITIVE DRIVES. Worthington Positive Drives save weight and space and reduce bearing loads for machines ranging from typewriters to 600-hp giants. It combines the advantages of both chain and belt. There's no stretch, no metal-to-metal contact and no lubrication.



MOTOR PULLEYS AND COMPANION SHEAVES. The new Worthington variable speed Motor Pulley gives speed ratios up to 3:1 in ratings from ½ to 15 hp. It has the simplest, most dependable of all motor pulley designs. The companion sheaves feature the Two Golden Screw construction.



CENTRIFUGAL CLUTCHES. These fully automatic clutches protect against overloads and simplify starting problems. Two basic models. A clutch-coupling for direct motor drives and a drive clutch, tapered to receive standard Hy-Torque Multi-Wedge Sheaves, Positive Drive Pulleys or sprockets.



HUBS AND WELD-ON ADAPTERS. Make your product "quick detachable"—easier to mount, always tight on the shaft, easier to remove. Weld the QD Adapter to any shaft mounted part. Then use Worthington QD Hubs with Two Golden Screws. Or machine your part to use the QD Hubs.

NOT SAFE

manuals shown here. Your Worthington distributor stocks these products.

See the Yellow Pages to locate your Worthington Distributor.

WORTHINGTON

PRODUCTS THAT WORK FOR YOUR PROFIT

Each Worthington product shown here has the complete safety feature of the Two Golden Screw design. For more information about any of these products, please send this coupon.

WORTHINGTON CORPORATION
Section 79-41, Oil City, Pa.

Please send me your new catalogs on:

- ☐ Multi-V Drives
- ☐ Multi-Wedge Drives
- ☐ Positive Drives
- ☐ Variable Speed Pulleys & Companion Sheaves
- ☐ Centrifugal Clutches
- ☐ QD Adapters

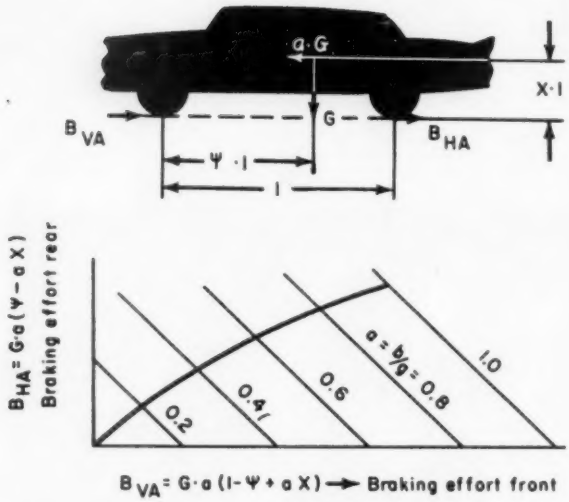
Name_____

Company_____

Address_____

City_____ State_____

A look at anti-skid brakes



DISTRIBUTION of braking effort between front and rear wheels depends mainly on location of center of gravity. Ideal distribution for the case shown at intersection of curve and the line a-1.

Only recently have anti-skid brakes been used in the automobile industry. High cost was one restriction. And side-skidding is greater in road vehicles than in airplanes or trains. The big problem was getting proper distribution of braking effort. Poor braking effort distribution means poor adhesion-utilization (compare graphs). This causes premature response of the anti-skid device and increased stopping distance.

THE UNCOMFORTABLE FEELING a driver gets when he loses control of his vehicle probably was experienced soon after man built the first wheel. And as vehicles have become more complicated, loss of control has become more serious.

The surest way to lose control of a wheeled vehicle is to cause it to skid or slide. This occurs when the same brake force is applied to each wheel, as in master braking systems. Friction at one wheel becomes less than at the other wheels, causing the rotary motion of the wheel or wheels to decelerate faster than the linear motion of the vehicle. The wheels ultimately lock. In effect, the vehicle becomes a sleigh.

With the development of disc-brakes for aircraft, the problem of skidding became acute. Because disc brakes allow far more rapid decelerations, friction inequalities result in more violent skids. Although anti-skid units were first used on railroad locomotives, they soon found large-scale use in aviation (1950). The high costs of these systems have restricted their use on automobiles.

What it is

Antiskid brakes in use today, typically consist of flywheels driven by each braked wheel through a system of gearing. An anti-skid valve is arranged to relieve the braking pressure when the deceleration of one braked wheel exceeds that of the others. When braking pressure is relieved, the wheel returns to normal rolling speed, and the braking pressure is again applied.

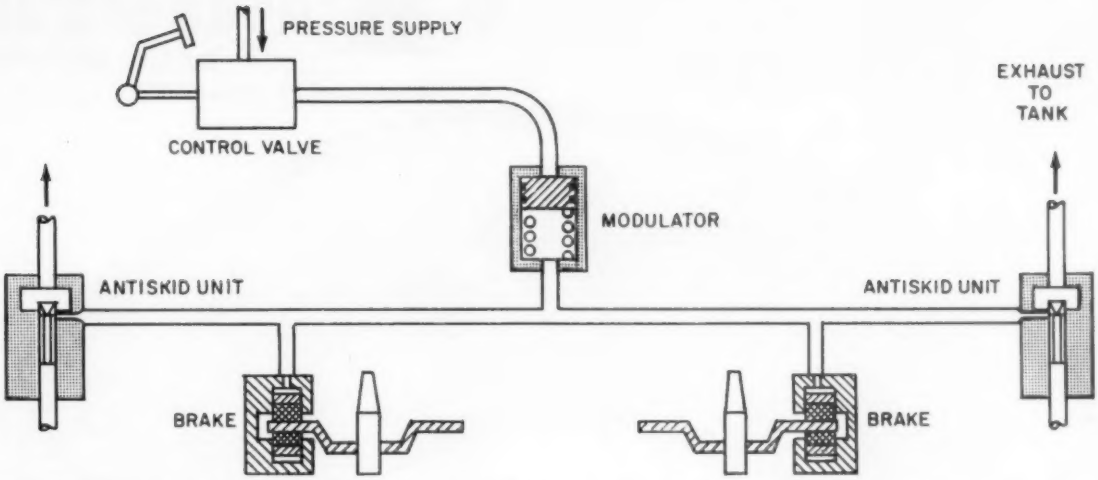
Uses

- In aircraft, preventing wheel locking avoids tire damage while braking. A skid of one second can damage a tire beyond repair. A prolonged skid will cause it to burst. This can endanger the plane at high speeds. A pilot is so far from the wheels, he usually is not aware of wheel locking. This makes an anti-skid device a necessity.
- In an automobile, the main danger is loss of directional stability. By preventing wheel locking, the driver can keep the car on the road and avoid obstacles while braking, even on wet or icy roads. Side slip can occur under certain conditions, but the risk is reduced.
- On commercial road vehicles, large load variations restrict brake design. An anti-skid unit would adjust the braking at each wheel according to the weight it carries. It would also adjust for tire-to-ground variation. With trailers, the chance of jackknifing due to rear wheel locking is reduced.

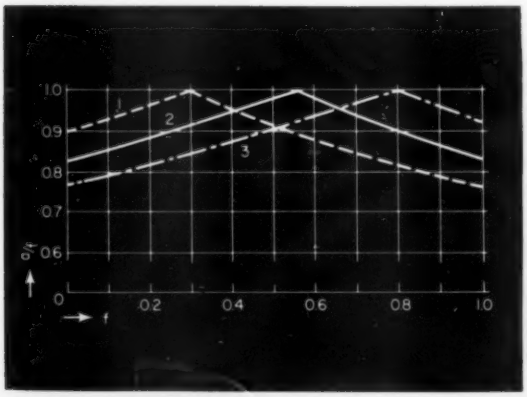
Types in use

Anti-skid units were first produced by Westinghouse Air Brake Co. for use on trains. Westinghouse made the first installation on aircraft using the same basic unit.

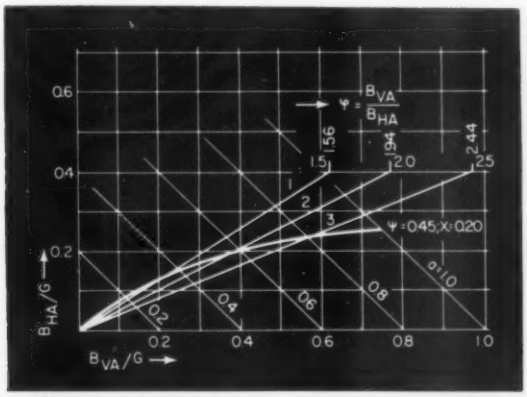
In early 1959, Hydro-Aire Co. made a unit with electrically operated valves. Actual skid detection is done by a flywheel operating electrical contacts. Hydro-Aire is the only manufacturer to put a road vehicle anti-skid unit on the market. An electromechanical system is used, for truck air brakes.



DRIVE TRANSMITS TO THE FLYWHEEL in this anti-skid unit for road vehicles. Being developed by Dunlop Rubber Co., the flywheel collapses a cam-spring assembly when wheel locking begins. This actuates a pressure relief valve.



ADHESION UTILIZATION a/f over adhesion between tire and road f (for example as per Fig. 4).



POSSIBLE fixed braking distributions (1, 2, 3) at a given ideal-distribution.

The same year, Dunlop Co. made their anti-skid available to the aircraft industry. Dunlop fits each wheel with a unit containing a small flywheel. The flywheel incorporates a spring and cam device. When both road wheel and attached flywheel decelerate normally, the preloaded spring does not deflect. If deceleration becomes excessive, as with the onset of wheel locking, flywheel torque rises. The cam moves and collapses the spring. This actuates a small hydraulic valve which relieves brake pressure until normal conditions return.

In the middle 1950's, two electro-mechanical systems came out, by Messier in France and Goodyear Co. in the U. S. They made use of the flywheel for skid detection. The Goodyear device used a generator and a charged condenser for skid detection.

The latest firm to enter this field is Bendix. They are using two systems. One is electro-mechanical, the other uses a generator for skid detection, and electrically operated valves.

Can anti-skid be improved?

Although these anti-skid units give directional stability and reduce stopping distance of a vehicle during braking, they do not assure the shortest possible stopping distance. This is blamed on lack of a proper definition of braking effort distribution. One suggestion is as follows:

Consider the tire adhesion as 'f'. Then the braking effort 'a' is a maximum at f. However, if a wheel is overbraked, the ground-to-tire adhesion would be higher than f, or a/f becomes less than 1. Hence a/f is called the adhesion-utilization. And even on icy roads, where f tends to zero, a/f can still be 1, if the brakes are correctly adjusted.

Ideally, the shortest possible stopping distance of a vehicle equals $v^2/2gf$, where v is its velocity, g equals gravity, and f is the tire adhesion.

The possible stopping distance depending on braking effort distribution—other factors remaining equal—equals $v^2/2g\,a$.

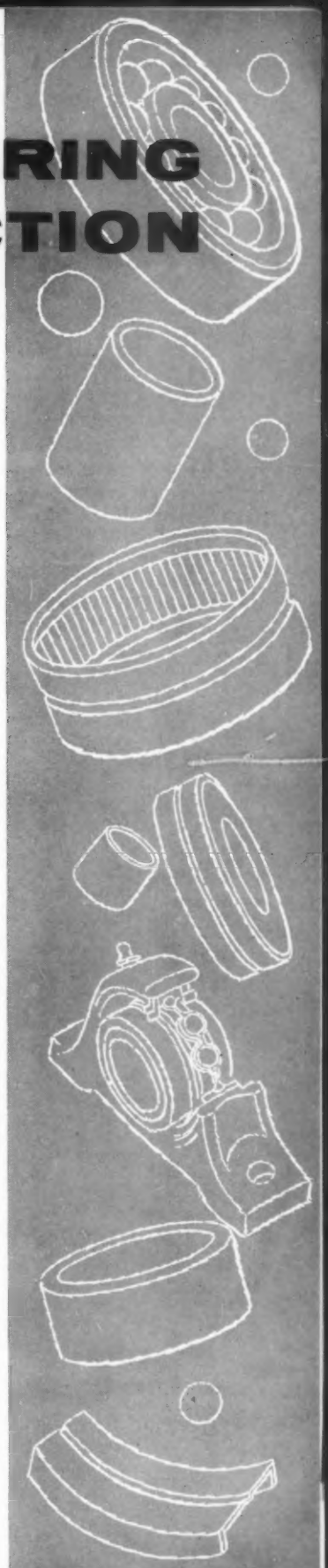
Federal
BALL BEARINGS

One of America's largest ball bearing manufacturers

Precisely how precise can you get? Never too much so for Federal's standards. That's why even our master gages have gages to keep them "on the button". In this specially air-conditioned room, we calibrate our master inspection gages on a machine accurate to within 0.000010"! It's one way we insure dimensional accuracy in every Federal ball bearing — radial, angular contact, thrust, self-aligning or shafted. Single or double row. Open or sealed. There are hundreds of types, in all sizes. Contact your nearest authorized Federal Ball Bearing distributor. The Federal Bearings Co., Inc., Poughkeepsie, N. Y.

FEDERAL BALL BEARINGS ARE AVAILABLE THROUGH SELECTED DISTRIBUTORS FROM COAST TO COAST

BEARING SECTION



Bearing Business

Harold L. Belanger joins POWER TRANSMISSION DESIGN as consultant bearings editor with this issue. Working out of New York, he will keep a sharp and experienced eye on the bearings industry, hunting out new developments and shipping the facts back fresh to our home office in Cleveland.

Harold is well known to bearing and power transmission people. A graduate of New York City College, he has worked as sales manager (for New Departure Bearings Div.), assistant chief engineer (for American Pulley), distributor sales manager (for TEK Bearings), and as engineering and sales consultant for an advertising agency. In one of the intervals, he experimented with his own corporation which made glass lined bearings and other components.

His experience will be a valuable asset in our policy of focusing more attention on this basic industry.

Kaydon Engineering Corp.—reduced prices up to 24% on all of its off-the-shelf thin section ball bearings. Price reductions were a result of an agreement with employees to increase production and accept lower incentive rates.

New Hampshire Ball Bearings—also lowered prices from 3% to 7% on individual catalog items ordered in production quantities on and after April 15. Price additives on some items of advanced design were cut out at the same time.

Federal-Mogul-Bower Bearings Inc.—transferred **R. Ryrie Smith** to San Francisco as district manager, and promoted **Charles H. Murphy** to acting Calgary district manager. Smith had been manager of the Calgary district since 1956. Murphy moves to Calgary from his position as Hartford district salesman.

Miniature Precision Bearings, Inc.—announced development of the world's cleanest bearing grease at the annual meeting of the American Society of Lubrication Engineers in Philadelphia.

Called Minapure, the grease meets the extreme purity requirements for bearings with production tolerances less than 50 millionths of an inch. No foreign matter can be seen in the grease under 500 power magnification. It's made at special processing plant in Keene, N. H., and is available under a 30 day delivery schedule.

Application tips for SPLIT NEEDLE BEARINGS

By **RICHARD SMITH,** *Chief Engineer, McGill Mfg. Co. Inc.*

RECENT DEVELOPMENTS in plastic bearing retainers make split bearings easier and more economical to use.

Plastic retainers hold the rollers. They are even being used for double retention of rollers. That is, they prevent the rollers from moving inward and outward (see pictures). This makes handling of loose bearing rollers unnecessary, and makes bearings easier to assemble. The separate retainer halves can be handled as single components of the bearing.

You can now use split needle bearings on many jobs that once were reserved for split sleeves. Split bearings have all the advantages of antifriction operation.

Construction: Split needle bearings are split into two parts. They are used when a whole bearing cannot be slid along the shaft. Typical examples: crank-

THIS SPLIT NEEDLE bearing contains center-guided parallel rollers.

A SNAP RING holds this split needle bearing in place when it is assembled.

THIS SPLIT NEEDLE bearing employs plastic retainers to hold the parallel rollers in position.

shafts and pumps. These bearings are also appropriate for shafts that have many other components. It is difficult and time-consuming to remove these components. The components need not be removed to put on split bearings.

Remember these design tips when you use split needle bearings:

1. Keep the load off the split. You can get split bearings with holes in the outer race 90 degrees from the split. A locating pin goes through the hole and into a corresponding hole in either the housing or cap. The pin has a shoulder so it doesn't interfere with the rollers.

2. The outer race should be split so that the two halves interlock when put back together. This assures proper mating. Then you need to pin only one half of the outer race. The jagged split locates the other half.

   The split is made through a splitting hole in the race. This splitting hole is usually offset slightly from the splitting notches in the face of the bearing. The notches have no function other than to define the location of split.

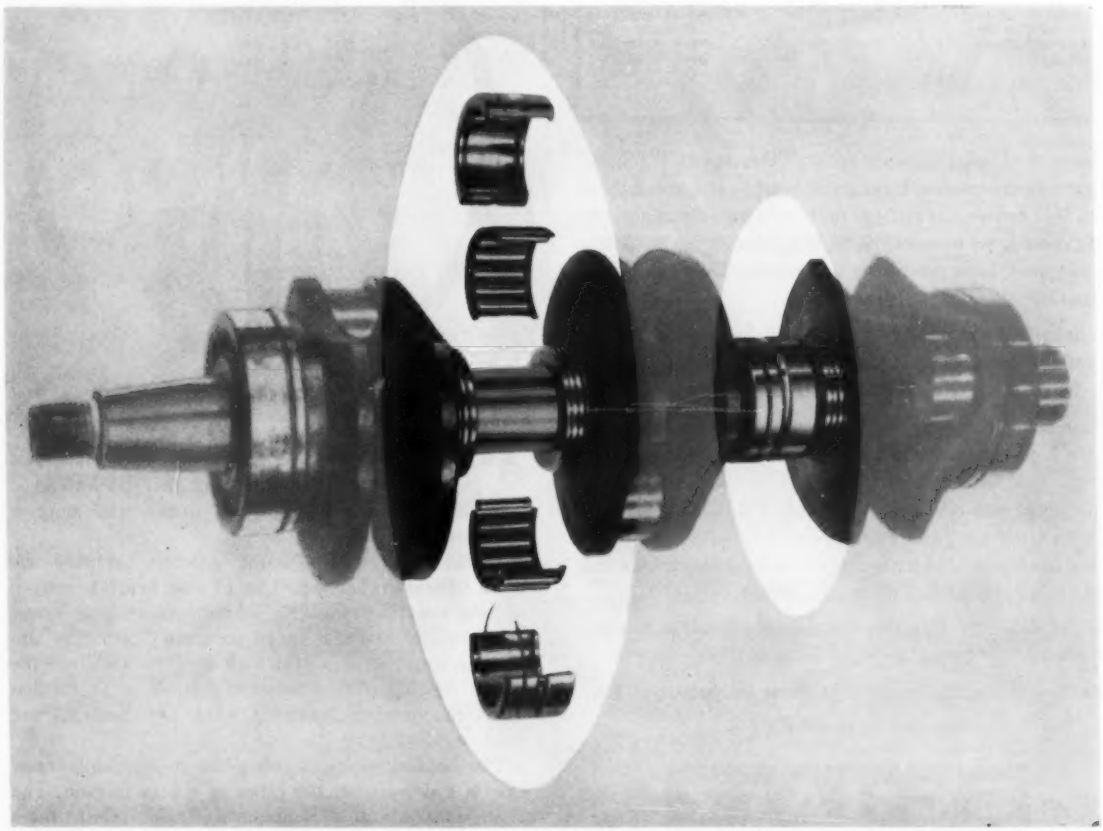
Mounting: To mount split bearings having loose rollers, coat the bearing section of the shaft with heavy grease. Stick the loose rollers in the grease while you position the outer race. Finally, mount the confining caps over this assembly.

Another way to mount split bearings is to hold them in place with a snap ring. The outer race has to have a snap-ring groove. Assemblers can mount the bearing on a crankshaft, for example, and the snap ring holds the bearing in place during subsequent operations.

Plastic retainers ease the assembly considerably. There are no loose rollers to handle.

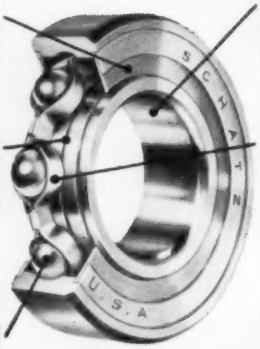
Plastic bearing retainers resist moisture well and will operate intermittently to 350F. The retainers can be molded to close tolerances. They guide the rollers well.

Plastic is easy and cheap to mold. This offers an initial advantage to users of split needle bearings with plastic retainers. There are further savings to users because they need not split or cut retainers in manufacture. The greatest advantage is double retention of rollers, eliminating loose rollers, with consequent production economy. ◆



A SPLIT NEEDLE BEARING with plastic retainers on the crankshaft of an outboard motor. Plastic retainers make it possible to assemble each retainer and roller complement as a separate component. This eliminates later handling of loose rollers.

How do the Ball Bearings you use measure up at these 6 important check points?


1
Sturdy plastic seal adjusts itself for wear. Tightens as pressure increases. Assures positive sealing with little drag.
2
All surfaces ground to close tolerances and smooth finish after heat treating and hardening for maximum life.
3
Highly-finished ball grooves, comparable to more expensive bearings. Accurate, with depth to take maximum thrust.
4
Ball cages evenly spaced to distribute load, reduce internal friction.
5
Through-hardened balls made in our own plant insure high quality.
6
Interchangeable with other — and more expensive type — bearings.
SCHATZ
U.S.A.

These 6 check points of Schatz "Functional Precision" bearing performance have proved out — and saved thousands of dollars—for many of the best known manufacturers of power lawn mowers, home laundries, home workshop equipment, farm machinery and others. They can do the same for your product, because

Schatz "Functional Precision" ball bearings provide all the precision you require—and need to pay for—under certain ratios of loads, speeds and life expectancy.

Their solid one-piece inner and outer races are machined from high quality steel. They are available in open type, single or double shielded; single or double sealed; with one shield and one seal. All double shielded and double sealed types are prelubricated. Bearings with snap rings, set screws, extended inner rings or special dimensions and tolerances may be had on special order.

Let us show you how these cost-saving bearings fit your production program. Write for Catalog 12.

The Schatz Manufacturing Company, 7640 Fairview Ave., Poughkeepsie, N. Y.

See our ad in SWEET'S

SCHATZ
"Functional Precision"
BALL BEARINGS

Circle **36** on Reader Service Card

One bearing replaces two

A 4-POINT CONTACT BALL BEARING can replace two angular-contact bearings mounted back-to-back. The single bearing takes radial, thrust, and moment loads simultaneously.

Radar and radio-telescope antennas employ the 95-in. diameter bearing. Use of one bearing instead of two simplifies housing design and reduces costs. The antenna operates more accurately with the single bearing than it would with two. In addition, the single bearing eliminates the thermal changes that affect the bearing mounting when two bearings are used.

The bearing contains two gears on the inner race. One is a drive gear, the other is a data take-off. The outer race contains a mounting guide. Both races have mounting holes. The bearing has an extremely thin section for such a large diameter.

The Kaydon Engineering Corp., Muskegon, Mich., makes the bearing. ◆

Improve your bearing designs with this wide choice of

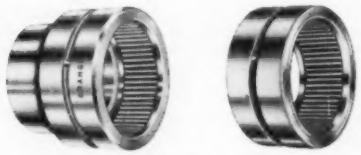
ORANGE NEEDLE ROLLER BEARINGS

Gives you broader opportunity to

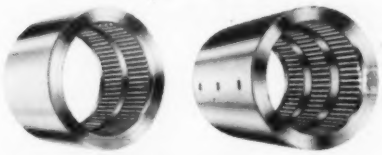
— simplify your designs
— meet load requirements
— save space, weight and cost

ORANGE *Full Type* ROLLER BUSHINGS

These heavy-duty full type needle bearings have rollers and races made of finest bearing steel—hardened, ground and finished to highest precision standards. Maximum load capacity in small space. Stocked in standard, interchangeable sizes from ½" to 8" shaft diameters.



With or without inner race



Double and Triple Row Types for extra-heavy duty

ORANGE *Cage Type* NEEDLE BEARINGS

Precision needle rollers are permanently aligned in antifriction cage to prevent roller skewing. Adapted to overhung mountings, vertical mountings, relatively high speeds and conditions of shaft deflection and misaligned housings. High load capacity and smooth, quiet running. Choice of cage designs to suit application. Available from stock in standard, interchangeable sizes from ½" to 8" shaft diameters.

With or without inner race

With built-in seals

Cage and Roller Assembly

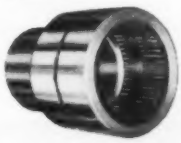
Used without races to save space and cost where shaft and housing are hardened and ground.

MC Series

Longer, larger diameter rollers give increased capacity — yet interchangeable with standard needle bearings.

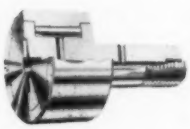
HS Series

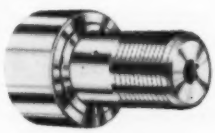
Heavier sectioned — larger rollers — higher capacity. Inch sizes between standard needle and cylindrical roller bearings.



Double or Triple Row Types for extra-heavy duty

ORANGE CAM FOLLOWERS





ORANGE CAM YOKE ROLLERS

SPECIAL ADAPTATIONS AVAILABLE

All Orange Needle Bearings can be made of special metals and special sizes and constructions to meet your requirements. Submit specifications.

WRITE FOR 44-PAGE CATALOG

giving details, dimensions, load ratings, shaft and housing tolerances on Orange Needle Bearings and other Orange Roller Bearings.

ORANGE ROLLER BEARING CO., Inc.
552 Main Street, Orange, N. J.

Needle Bearings — Staggered Roller Bearings
Journal Roller Bearings — Thrust Roller Bearings
Cam Followers

ORANGE

Circle **30** on Reader Service Card

IDEAS

Air-operated clutch cuts costs

SUBSTITUTING AIR-OPERATED CLUTCHES for electric clutches on small metal-spinning lathes has cut maintenance costs for Acme Metal Spinning Co., Minneapolis.

Blanks and patterns employed in metal spinning on lathes should be brought to spinning speed slowly and evenly. Possibility of damage to the spinning material is greatest while it's coming to speed.

One way to accelerate the spindle softly is to install a clutch between the variable-speed drive and the lathe spindle.

On small lathes (under 5 hp), electric clutches performed unsatisfactorily during acceleration. Also, clutch slipping while trimming at slow speed caused overheating and raised repair costs.

The new air-operated clutches provide soft starts, better machine operation, less maintenance, and more uniform product quality. ◆

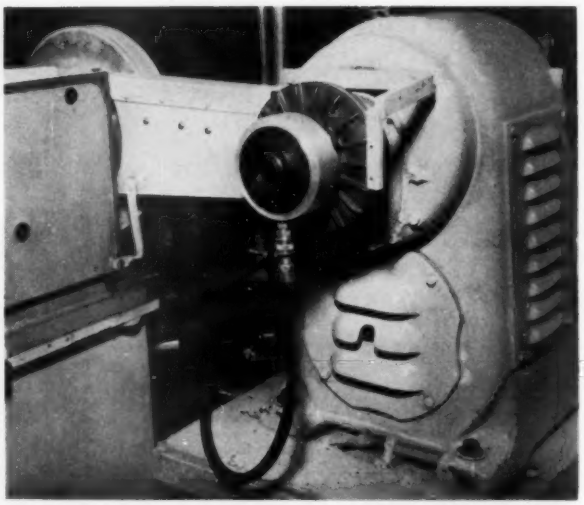
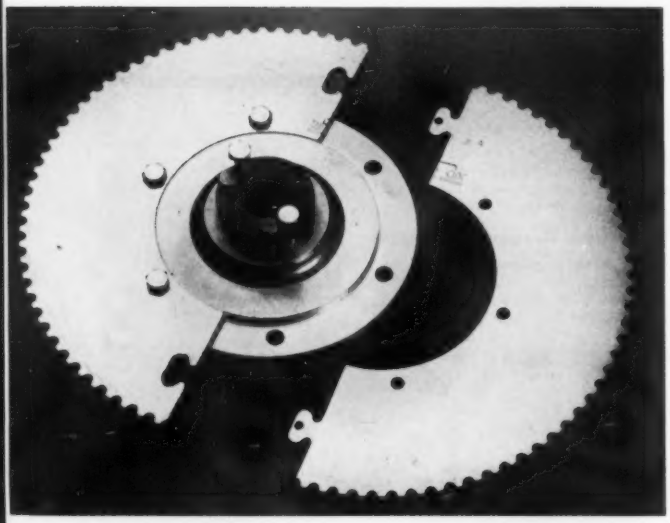


Photo Courtesy of Horton Mfg. Co.

STATIC AIR PRESSURE controls clutch attached to output shaft of variable-speed drive of small spinning lathe. Cooling fins dissipate heat, reduce surface-friction damage within the self-adjusting clutch.

Split sprocket has jigsaw tabs



DIFFICULTIES WITH GO-KART SPLIT SPROCKETS led to a new split-sprocket design.

Alignment bolts on conventional split sprockets occasionally came loose when the karts were driven. Then the sprocket halves moved out of position. The drive chain could be snagged by, or thrown off, the sprocket—presenting a serious hazard to young karters.

H. B. & S. Precision Mfg. Co., El Monte, Calif., remembering jigsaw puzzles, overcame the difficulties. They designed a die that would cut locking tabs on the split sprocket.

Split sections mate at the locking tabs. The tabs provide a binding friction between sprocket halves. Sprocket halves require no additional fastening after the sprocket assembly is bolted to the wheel hub. The sprocket is completely circular when locked. ◆

PRODUCT NEWS

To get complete information on these products, use the Reader Service Cards bound into this issue.

New 90° gear box

Consists of a cast bronze housing and two spindles with bevel gears supported in needle bearings.

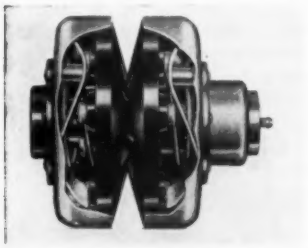
Gears are splined internally and are pinned for lateral holding only. Spindle stub shafts, keyed, or splined to attach to universal joints for reach rod controls, or to attach to flexible shafts. Short spindles, so the box can fit into sharp corners. Three sizes with torque capacities of 500, 2000 and 3500 lb, with about an 88% efficiency. Furnished in standard or non-corrosive materials.

Stow Mfg. Co., Binghamton, N.Y.

Circle **200** on Reader Service Card

Variable speed pulleys

Models 1060, 1160, 1280 and 1390 for wider V-belts have faces that are independently actuated by spring and cam assemblies. The



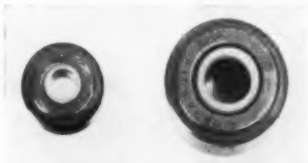
wedging action of each cam and follower prevents pulley spread and keeps the belt in proper alignment. Belts used are Nos. 087, 12 or 14 top width. Standard bore sizes from ⅝ to 1¾ in., and keyways 3/16 x 3/32 in. and ¼ x ⅛ in. Other data: bore lengths 2½ in. to 3⅝ in., max. pitch diam. 1.875 to 2.87 in., motor travel 3⅜ to 4 in. Overall dimensions 5⅜ in. to 7½ in. long by 6 in. to 9 in. OD.

Hi-Lo Mfg. Co., Chicago, Ill.

Circle **201** on Reader Service Card

Packaged journal bearing

An unusual design of journal bearing uses a one-piece sintered bronze combination bearing and housing. Space between the members is packed with Permawick self wicking lubricant which, with an arrangement of oil slingers and closures, give a life-time recirculatory oiling system. Comes in 13



standard sizes from ¼ in. ID–⅝ in. OD, to 20mm ID–47mm OD. Temperature range of −25 F to 200 F. Not for stationary shaft applications since centrifugal force may force oil through the outer facet seal.

Tann Bearing Co., Tann Corp., Detroit, Mich.

Circle **202** on Reader Service Card

Electronic drive systems

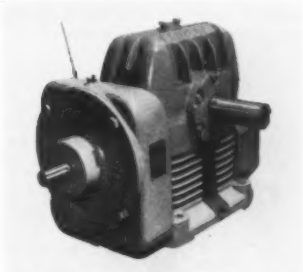
Models 1P11-20 and 1P81-20 have been added to the Servospeed line which covers from 1/100th to 10 hp systems. The new models are 5 hp, for 440 v. 60 cycle operation, come complete with a 2400 rpm base-speed motor variable from 60 to 2400 rpm. Torque rating is base speed torque through entire speed range; speed regulation is within 2% of set speed over that range from no load to full load. Optional uni- or bi-directional and other special features.

Servospeed Div., Electro-Devices, Inc., Paterson, N. J.

Circle **203** on Reader Service Card

Helical reducer attachment

For all Radicon fixed base worm gear reducers with center distances of from 4 to 8 in. The



Helical Attachment provides increased ratios from 30:1 to 304:1 at a mechanical input hp range of 0.97 to 22.8. Torque can be increased from 19,000 in. lb to 39,800 in. lb. Attachment uses Duti-Rated gearing and standard components for easy mounting and speed change.

Foote Bros Gear & Machine Corp., Chicago, Ill.

Circle **204** on Reader Service Card

Electromagnetic brakes

The BA-ER miniature series brake when de-energized and release when energized. Size 100, body diam. 1-7/64 in., mounting flange diam. 1-9/16 in., has a braking torque of 10 in. oz minimum for 2 watts input. Priced at $49. Size

130, body diam. 1-9/16 in., mounting flange diam. 2¼ in., has a braking torque of 30 in. oz minimum. for 3⅜ watts input. Basic model at $52. Standard voltages (dc only) are 6, 12, 28, 48, and

PRODUCT NEWS

100. A feature is an optional manual release in case of power failure. Or user can preset the slip-point torque.

Dial Products Co., Bayonne, N. J.

Circle **205** on Reader Service Card

Miniature cam followers

This series of stainless steel precision cam followers, with outside diam. from ¼ in. to ⅝ in., are for close quarter precision timing applications. Available in face

widths from .1406 to .1960, the followers are made with a shielded ABEC 7 tolerance ball bearing fitted on a concentric ground shaft to ensure full contact tracking. Priced at $3.95 to $4.40 each, with spacers, lock washer and hex nut.

PIC Design Corp., East Rockaway, N. Y.

Circle **206** on Reader Service Card

New Bowman chain

Chain features: 40% fewer wearing surfaces; a reduction of 33⅓% in wearing parts; 39% greater

bearing area and 66% more pin capacity. Can be turned over for extra wear life. Recommended for use on hardened sprockets. Ultimate tensile strength or actual breaking load has been increased 58%. Now available in 2 in. pitch sizes.

The Jeffery Mfg. Co., Columbus, Ohio.

Circle **207** on Reader Service Card

Shaft seals take apart

Called Tak-Apart Seals because they can be dis- and reassembled by hand, these mass-produced seals conform to all standard face-type cartridge seal dimensions. For low volume users, this take apart feature means no tooling costs, easy ordering from stock catalogs, and quick replacement of worn out components. Aluminum outer shell and adapter, standard O-ring packing and a Teflon coated inner sealing surface. Sizes up to 4 in.

Gits Bros. Mfg. Co., Chicago, Ill.

Circle **208** on Reader Service Card

High speed clutches for tractors

Dual Drive FA clutches use a counter-balanced release lever with an anti-friction roller action for quick disengagement and longer bearing life. An auxiliary

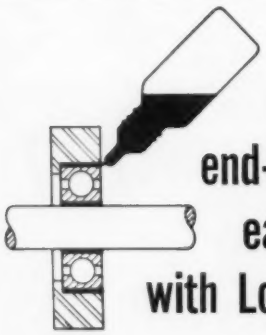
SPECIALISTS
IN Specials
No. 7373 Business machine idler bearing Approx. full size.
No. 6889-2 Business machine guide roller. Approx. full size.

NICE "specials" provide the Product Designer with exceptional opportunities for cost reduction and product improvement. The properly designed "special" not only performs its basic bearing function, but may incorporate features that simplify mounting or installation, or combine several components into a single interchangeable "package" unit. NICE engineers are well qualified to design bearings that will fulfill particular application requirements . . . economically and efficiently.

Can NICE help you?

NICE BALL BEARING CO.
NICETOWN • PHILADELPHIA • PENNSYLVANIA

Circle **29** on Reader Service Card



Loose-fitting end-bell bearings easily repaired with Loctite sealant

2¢ worth of Loctite Sealant, the plastic that acts as a "liquid shim," restores bearing fits in electric motor end-bells. Just a drop or two of Loctite on both bearing and housing does the job in minutes. Eliminates need for reboring, sleeves, shims, metallizing. Bearings mounted with Loctite can be removed with ordinary bearing removal tools. Comes ready to use. No mixing.

Call your distributor, or write us for literature and free sample

LOCTITE® SEALANT

AMERICAN SEALANTS COMPANY
457 N. Mountain Rd., Hartford 11, Conn.

Circle **3** on Reader Service Card

drive from the flywheel through a splined hollow shaft provides a power take-off.

Maximum driving contact from 12 engagement springs spaced over the facing area. Through a choice of engagement springs and friction materials, clutches can be had in a range of torque capacities.

Rockford Clutch Div., Borg-Warner Corp., Rockford, Ill.

Circle **209** on Reader Service Card

Spring loaded Teflon seal

Standard flange seals feature a stainless steel spring insert which acts as a compensating pressure on the Teflon seal for tolerance variations, thermal expansion or contraction and cold flow of the plastic. Flexible, adjusts to out of round or warped flanges. Re-usable after disassembly of a flange joint. Unaffected by aging and can be used on any flange, including ASA types. Temperature range from −420 to 500 F.

Raco Engineering, Santa Monica, Calif.

Circle **210** on Reader Service Card

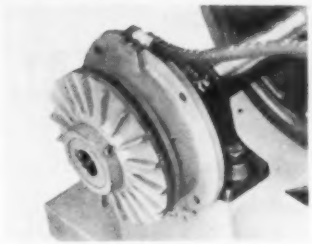
FHP motor line

Totally-enclosed, non-ventilated, three-phase, Form G motors are rated from ¼ to ¾ hp and 220/440, 220/380 and 550 volts. The ¼ hp models are in NEMA frame sizes 48 and 56; all other models are NEMA size 56. The line features continuous duty operation at 55 C rise; single shielded ball bearings; and a steel base welded to the shell to withstand shock.

General Electric Co., Schenectady, N. Y.

Circle **211** on Reader Service Card

Static pressure brake



Operating on static air pressure, this air brake comes in two models for applications up to 2400 in. lb torque. Forced draft fin cooling is used to protect the isolated friction disc from heat build-up. Flange or torque-arm type universal mounting. Self-adjusting.

Horton Mfg. Co., Inc., Minneapolis, Minn.

Circle **212** on Reader Service Card

Worm gear lubricant

Two grades available—Conedroil A exceeds AGMA 8 and 8A re-

continued on page 50

Circle **25** on Reader Service Card

MANY FAST'S HAVE BEEN WORKING LONGER THAN YOU

It's a fact. There are plenty of cases where Fast's Couplings have been in service 20 to 40 years. And some of our more enthusiastic engineers say a Fast's should last forever if it's properly applied, installed and lubricated. Whatever opinion you accept, you can bet Fast's Couplings will give you the same smooth-running, low-maintenance, long-lived performance that makes them the choice of more equipment manufacturers than any other gear-type coupling.

For example, Fast's Coupling No. 1347, shipped in July, 1922, is still in service—and the customer is just ordering his first spare coupling 38 years later.

KOPPERS COMPANY, INC., 906 Scott Street, Baltimore 3, Md.

KOPPERS FAST'S COUPLINGS
Engineered Products Sold with Service

NEW LOW COST
STEEL PINTLE
CHAIN
for industrial and agricultural applications where long chain life, low cost and low maintenance requirements are governing factors.
send for Catalog 60.
THE LOCKE STEEL CHAIN COMPANY
1250 SABINE STREET, HUNTINGTON, INDIANA

Circle **26** on Reader Service Card

POWER TRANSMISSION DESIGN

FREE REFERENCE MATERIAL from this month's ads

Readers may obtain any of these reference materials by circling the numbers on the reader service cards.

1. CHAINS—Acme Chain Corp. offers 100 page illustrated chain catalog with engineering section and application data.

3. PLASTIC SEALANT—American Sealants Co. is giving a free sample, plus literature, of Loctite sealant.

5. DRIVE CHAINS—Atlas Chain & Mfg. Co. detail many types of drive timer and conveyor chains in a catalog.

7. LUBRICANT—Alpha-Molykote Corp. offer free sample of Molykote M-88 anti-seize lubricant.

8. GEARS—Charles Bond Co.'s catalog has detailed engineering charts and diagrams for easy gear specifying.

10. BEARING MATERIALS—Bunting Brass & Bronze Co. covered cast and sintered bronze, nylon and aluminum.

11. PT EQUIPMENT—Browning Mfg. Co. celebrates its 75th year with an anniversary catalog which covers most types of power transmission equipment.

13. SPEED REDUCERS—Cleveland Worm & Gear Div. (Eaton Mfg. Co.)—Bulletin No. 405 gives complete engineering and design information.

14. CHAIN & SPROCKETS—Diamond Chain Co.'s catalog contains dimensions and list prices, bushing installation and removal instructions.

15. ELECTRIC CLUTCHES—Eaton Dynamatic Div. offer illustrated literature on Dyna-torQ electric clutches and brakes.

OFFERED FOR THE FIRST TIME . . .

The services and reference materials listed here are being offered by advertisers for the first time to readers of POWER TRANSMISSION DESIGN

20. SPEED REDUCERS—Horsburgh & Scott Co.'s Catalog HH-61 features the new sizes of helical and herringbone reducers.

23. OVERLOAD CUTOUT—Janette Div. of National Pneumatic Co. describes an adjustable torque overload cutout with close limits.

36. BALL BEARINGS—The Schatz Mfg. Co.'s Catalog 12 a variety of types designed to save costs on production programs.

39. MINIATURE CLUTCH—Stearns Electric Corp. has a 540 lb. in.-torque miniature clutch. New Product Preview No. 1-61-C.

16. FLEXIBLE SHAFTS—Elliott Mfg. Co.'s Catalog 263 gives all the necessary design data.

18. GEARING GUIDE—Gear Specialties Inc. describe their helical and spiral and other types of gears. Charts.

26. PINTLE CHAIN—Locke Steel Chain Co. gives the details on their steel pintle chain in Catalog 60.

21. PULLEYS—Hi-Lo Mfg. Co.'s Bulletin H-61 deals with variable speed pulleys with cam control, and other types.

27. DRIVE CATALOGS—Maurey Mfg. Co.'s Catalog B-60 has all the details on Super-Wedge V-drives and many other types.

28. CLUTCHES—Minster Machine Co. describes air clutches for press conversion in Clutch Conversion Booklet CC57.

30. NEEDLE BEARINGS—Orange Roller Bearing Co. has a 44-page catalog giving dimensions, load ratings and tolerances on needle and other type bearings.

34. CLUTCHES—Rockford Clutch Co. tell about reliability tests in an illustrated brochure.

48. FLEXIBLE COUPLINGS—Sier Bath Gear & Pump Co. offer detailed information on a complete flexible coupling line in a catalog.

41. BEARINGS—Triangle Mfg. Co. offer descriptive literature on standard and special application bearings.

42. MAGNETIC DRIVES—Tormag Div., Gleason Reel Corp. detail a standard line of 1-10 hp magnetic drives.

44. MOTOR DRIVES—U. S. Electrical Motors, Inc., describes the Varidrive line, available from ¼ hp up, in color Bulletin No. F. 1797.

45. ELECTRO-SHEAVE CLUTCH—Warner Electric Brake & Clutch Co. highlight their line of quickly installed electro-sheave clutches with drawings and selection charts.

PM* or REPAIR . . .

Avoid unplanned downtime . . . Keep rolling equipment on the move; keep stationary units and tools in operation by making necessary bearings replacements with New Departure Ball and Hyatt Roller Bearings. They have become the standards of the industry because of their reliability and long life under the most severe service conditions.

Whatever the reason for equipment being out of service and in the shop, the important thing is to get it on the job quickly and keep it working. New Departure and Hyatt Bearings help you do it. These top quality, precision bearings are close at hand through the national network of Authorized New Departure and Hyatt Distributors.

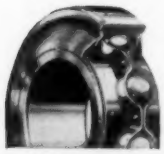
* **P**reventative **M**aintenance

HYATT roller bearings come in a wide variety of types and sizes from ¾" OD to 14" OD. They handle radial loads of up to 103,000 pounds, speeds as high as 50,000 RPM. Standard bearings operate efficiently from below zero temperatures to 450 degrees F. Special steels, if desired, push the temperature range higher.

METRIC SERIES . . . Precision roller bearings for transmissions and gear boxes with built-in extra capacity. Will handle heavy radial loads, with intermittent thrust loads.

WOUND ROLLER . . . Made in all sizes, operates with inner race or directly on shafting. Resists extreme shock, abrasion and fatigue.

NEW DEPARTURE ball bearings have a wide range of seals to retain bearing lubricants and keep out contaminating matter. Each seal is designed as an integral part of a bearing. The result is greater bearing efficiency, less downtime, longer life.



LAND-RIDING SEAL AND TRASH SHIELD . . . Excellent for severe contaminant conditions, moist or dry. Rubber is bonded to steel insert, crimped into outer ring.

LAND-RIDING SEAL, PRESSED . . . For severe conditions. Rubber is bonded to rigid steel "L" frame and pressed into outer ring ID for positive seal.

SENTRI-SEAL . . . Most popular seal in use today. For every contaminant condition. Metal insert, molded in rubber seal which has positive contact with ground inner ring groove.

HYATT NEW DEPARTURE

Available nationally through UMS Authorized New Departure and Hyatt Bearings Distributors

GM U-M-S PARTS SALES UNITED MOTORS SYSTEM

Circle **43** on Reader Service Card

Large or small INDUSTRIAL CUT GEARS

- FURNISHED COMPLETE
- CUSTOM CUT FROM YOUR BLANKS
- HEAT-TREATED, CASE OR FLAME-HARDENED

SIMONDS GEAR produces a complete line of industrial cut gears in a full range of sizes from cast or forged steel, gray iron, bronze, Meehanite, rawhide or bakelite. Also heat-treated, case or flame-hardened carbon or alloy steel. Or, you may have your own gear blanks custom cut to your order. Same quality . . . same prompt service. Send us your requirements for quotation.

ALSO stock carrying distributors of Ramsey Silent Chain Drives and Couplings; and industrial V-belts.

SPUR GEARS • BEVEL GEARS • MITRE GEARS
WORMS • WORM GEARS
RACKS
PINIONS

MEMBER OF AGMA

THE SIMONDS GEAR & MFG. CO.

Liberty at 25th, Pittsburgh 22, Pa.
Quality Gears for over 65 Years

Circle **37** on Reader Service Card

PRODUCT NEWS

quirements and Conedroil B exceeds AGMA 7. Composition is fatty and chemically-combined E.P. agents for long effective life and good extreme pressure characteristics.

Shear Speed Chemical Products, Detroit, Mich.

Circle **213** on Reader Service Card

Heavy duty flexible couplings

New additions to the Type H line bring the ratings up to 8500 hp, with bore sizes up to 9½ in. In-

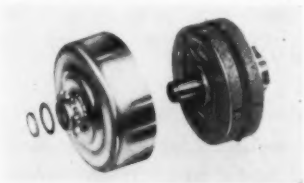
dividual load cushions can be removed without disturbing driving or driven units. Bodies and jaws are machined electric steel or nodular iron castings. Variety of load cushion materials available.

Lovejoy Flexible Coupling Co., Chicago, Ill.

Circle **214** on Reader Service Card

Kart clutch

For ¾ or 1 in. shafts, this clutch has a hardened and ground solid shaft extension and caged needle bearings. Horsepower and torque



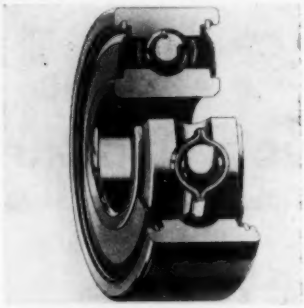
capacity up to 7 hp, 1500 rpm engagement, chrome finish, 360-degree shoe contact. Easily installed with 2 Nylon set screws to the outside. All shoes, springs, bearings and housings are replaceable. Housings are interchangeable.

Mercury Clutch Div., Automatic Steel Products, Inc., Camden, N. J.

Circle **215** on Reader Service Card

Sealed precision bearings

The Flexeal is a standard precision Barden bearing, with a rubbing seal of fiber-aluminum laminate installed in the shield groove of the outer ring, which seals against a ground surface on the inner ring. Working temperatures range up to 300 F. Speeds as high



as unsealed bearings, with no loss of lubricant. Ten flanged and three unflanged sizes from 0.3125 in. to 2.4409 in. OD. Prices slightly higher than ABEC-7 shielded bearings.

The Barden Corp., Danbury, Conn.

Circle **216** on Reader Service Card

Microminiature accelerometer

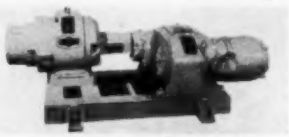
Model 2227 weighs 3.1 gm, is 3.8 in. hex and ⅛ in. high, and has an integral 6-32 stud. Design provides mechanical isolation from noise-producing cable stress. Voltage sensitivity with 180 pf external capacity, is 5 pk-mv/pk-g nominal; resonance frequency is 30 Kcps nominal. Cross axis sensitivity is 5% max. Temperature range is −65 F to 350 F, with 15% or less nominal sensitivity deviation throughout this range.

Endevco Corp., Pasadena, Calif.

Circle **217** on Reader Service Card

Motor generator set

High frequency motor generator sets, revolving field type, produce ac that can be varied from 400 to 500 cps by a crank adjustment on the variable drive. An automatic voltage control allows plus



or minus 1% regulation. Set is 56 in. long, 26 in. wide, and 22 in. high. The generator is rated 2.5 KVA at 80% power factor, has 14 poles, and develops top frequency at 3428 rpm. Motor is 5 hp, 3 phase, 220 v., 1800 rpm, synchronous type.

Kato Engineering Co., Minneapolis, Minn.

Circle **218** on Reader Service Card

Pillow blocks

Two series—the 9-500, and the 6-700 with ball bearings. The 9-500 models have flanged oilite bearings that provide against side thrust. Built-in oil reservoir. Bearings are reamed for accurate fit and the block will accommodate a 2 in. pulley on a flat surface. The 6-700 series use precision ball bearings packed in grease with nylon sealers and hollow-head set screws. Will also take a 2 in. pulley.

Chicago Die Casting & Mfg. Co., Chicago, Ill.

Circle **219** on Reader Service Card

Motor mounting rings

New line of De-Sta-Co electric motor mounting rings features sharper corners, and "T" or "V" interlocking closures which prevent their intertwining during shipment. Plain finish or plated at slight extra cost.

Detroit Stamping Co., Detroit, Mich.

Circle **220** on Reader Service Card

Automatic clutch

The new Centri-Dyne clutch is for 6 to 10 hp gas or diesel engines. Has stronger heavy-gauge steel construction and provides built-in forced draft ventilation.

Wide range of models, including standard sizes of single and double groove sheaves, chain sprockets, timing belt pulleys and direct coupling clutches.

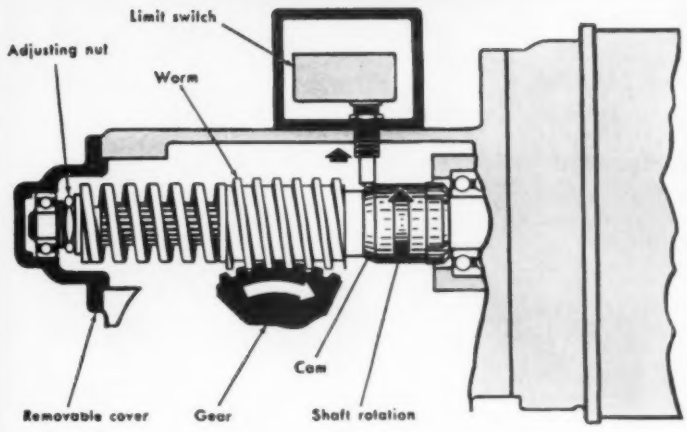
Salsbury Corp., Los Angeles, Calif.

Circle **221** on Reader Service Card

Miniature limit stops, slip clutches

BUORD size 5 and 8 miniature mechanical limit stops, fully ad-

NOW POSITIVE PROTECTION for MOTORS and MACHINERY



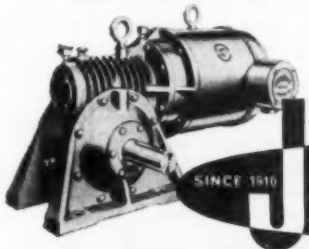
As long as applied torque is within pre-determined limit, spring bears against end of worm and holds it centered on gear. Excessive torque causes worm to move axially along splined motor shaft, compressing spring and bringing cam surface in contact with limit switch which cuts power, stopping motor.

...JANETTE Adjustable Torque Overload Cutout

Here's *dependable* protection for drive units, driven mechanisms, personnel, and work in progress . . . and a sure-fire way to reduce down-time.

Janette Adjustable Torque Overload Cutout is far more sensitive than conventional shear pins, or friction clutches and similar devices. Its sliding worm on a spline shaft (described above) assures shutdown of the driving motor within closely controlled torque overload limits. Unit is easily reset when cause of overload is removed.

Color-coded, interchangeable springs permit selection of a wide range of torque limits. Each spring has a simple linear adjustment over its own range. Protect *your* equipment and avoid costly downtime the *positive* way . . . with Janette Adjustable Torque Overload Cutout. Write today for Bulletin 5-7.



SINCE 1910 Janette GEAR MOTORS MOTORS SPEED REDUCERS

Division of National Pneumatic Co., Inc., Boston 19, Mass.

Circle **5** on Reader Service Card

PRODUCT NEWS

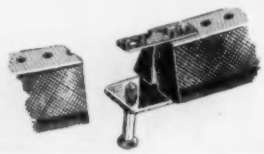
justable from 0 to 14,400 degrees, feature a non-jamming design, low starting torque and repeatability to within 3 min. of arc. Torque rating on size 5 is 80 oz in. and 160 oz in. on size 8. Complementing precision slip clutches use Delrin as the bearing material, and include a Precision Class I stainless steel gear in 72, 96 or 120 pitch.

Northfield Precision Instrument Corp., Island Park, N. Y.

Circle **222** on Reader Service Card

Perforated V-belting

With this open-end perforated V-belting you can make your own V-belts with a screwdriver. This



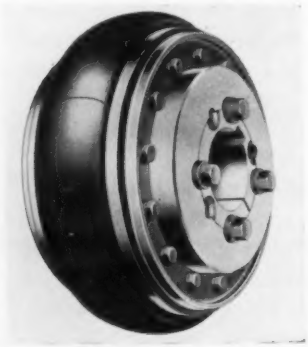
design improvement of the original now produces both plates prebent, which allows the fastener to follow the angle over the smallest diameter pulleys. All screws are now made of alloy steel instead of brass.

Rockwood Pulley Mfg. Co., New York, N. Y.

Circle **223** on Reader Service Card

Flexible cushion coupling

The PX280, largest in the Para-Flex line, will handle 400 hp per 100 rpm, or 3640 hp for the max. recommended speed of 910 rpm.



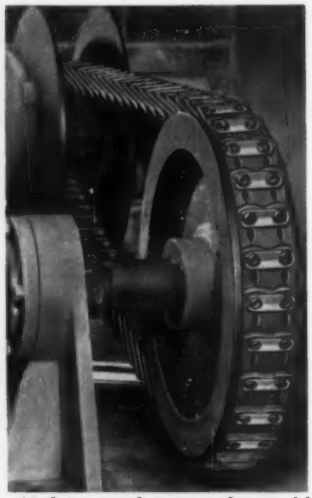
The new coupling has the standard tire-shaped flexing element, and is available with Taper-Lock bushings for shafts up to 7 in. or may be ordered bored to size for shafts up to 9 in.

Dodge Mfg. Corp., Mishawaka, Ind.

Circle **224** on Reader Service Card

Link belting

Adjusta-Link variable speed belting, single or twin link, widths from ⅜ in. to 4 in., fits all V



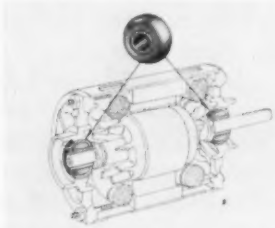
to V drives and is interchangeable with wood block and endless molded belts. Oil and heat resistant, pre-stretched, with die cut links. Installed or detached with a pair of pliers and a simple hook tool. Longitudinal flexibility to fit small pulleys.

Lovejoy Flexible Coupling Co., Chicago, Ill.

Circle **225** on Reader Service Card

Midget bearing cartridges

This line of permanently lubricated, self-aligning midget bearing cartridges now includes shaft sizes



ranging from 1/8 in. through 5/8 in. Three series available: 0039, 0049, and 0059, of sintered construction, with a wall thickness of 1/16 in. Shaft sizes: 1/8, 3/16, 1/4 in. for series 0039; 3/16, 1/4, 5/16, 3/8 and 7/16 in. for series 0049; 7/16, 1/2, 9/16 and 5/8 in. for series 0059. Series 0049 has a length of 11/16 for the 7/16 in. cartridge. Cartridges were designed for small fractional hp motors, now have applications in computers, textile equipment, etc.

Randall Graphite Bearings, Inc., Lima, Ohio.

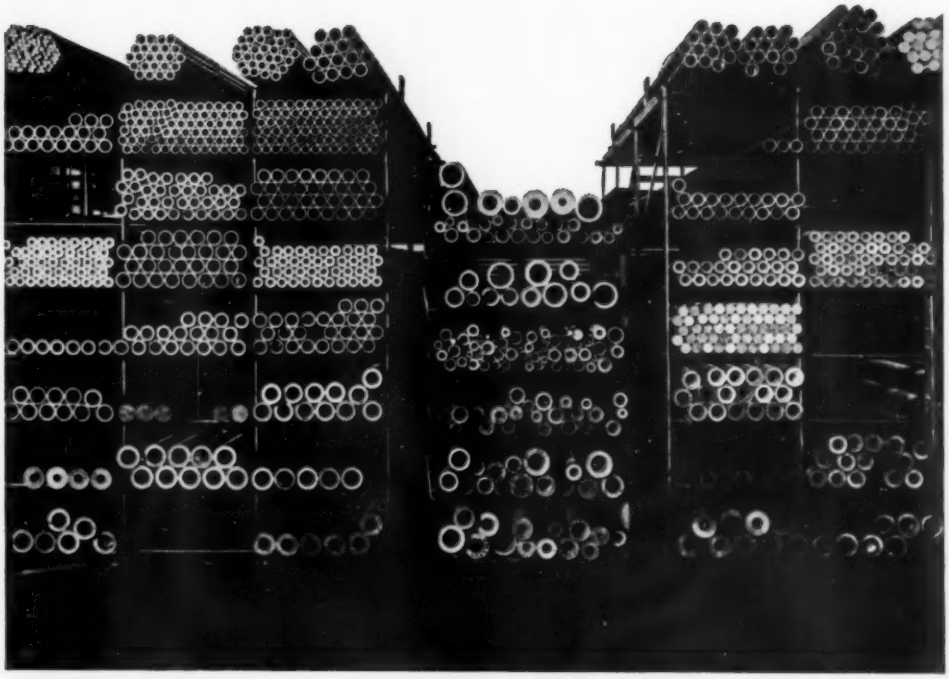
Circle **226** on Reader Service Card

ASARCON

DISTRIBUTORS for ASARCON CONTINUOUS-CAST BRONZE:

ALABAMA
Birmingham
Dixie Bronze Co., Inc.
FA-4-4588
J. M. Tull Metal & Supply Co., Inc.
FAIRFAX 3-1612
ARKANSAS
Little Rock
Arkansas Foundry Company
FRANKLIN 2-6761
CALIFORNIA
Los Angeles
Kingwell Bros., Ltd.
LUDLOW 2-7427
San Francisco
Kingwell Bros., Ltd.
SUTTER 1-0514
CONNECTICUT
Guilford
Knapp Foundry Co., Inc.
GLENDALE 3-2744
Seymour
The Derby Castings Co.
TUXEDO 8-2581
Stratford
The Ellsworth Industrial Supply Co.
EDISON 7-3317
FLORIDA
Jacksonville
J. M. Tull Metal & Supply Co., Inc.
EVERGREEN 7-5581
Miami
J. M. Tull Metal & Supply Co., Inc.
OX 6-0150
Tampa
J. M. Tull Metal & Supply Co., Inc.
TAMPA 3-6741
GEORGIA
Atlanta
J. M. Tull Metal & Supply Co., Inc.
JACKSON 5-3871
ILLINOIS
Chicago
Bearing Headquarters Co.
Div., Ray M. Ring Co., Inc.
ESTEBROOK 9-0300
Bronze Bearings, Inc.
JUNIPER 3-1100
Peoria
Ray M. Ring Bearing Co.
PEORIA 6-73-8171
Rockford
Rockford Tool & Transmission Co.
ROCKFORD 2-7711
Waukegan
Bearing Headquarters Co.
Div., Ray M. Ring Co., Inc.
MA 3-5212
INDIANA
East Chicago
Bearing Headquarters Co.
Div., Ray M. Ring Co., Inc.
E. CHICAGO EX 7-8020
SAGINAW 1-8660
Indianapolis
Jones & Laughlin Warehouse Div.
Jones & Laughlin Steel Corp.
MELROSE 1-8311
South Bend
Powell Tool Supply, Inc.
ATLANTIC 9-5578
KENTUCKY
Louisville
Williams & Co., Inc.
JUNIPER 3-7781
LOUISIANA
New Orleans
Standard Brass & Mfg. Co.
AUDUBON 1381
Shreveport
Standard Brass & Mfg. Co.
UN 5-4241
MARYLAND
Baltimore
Bronze Specialties, Inc.
LEXINGTON 9-1906
MASSACHUSETTS
Boston
Kelco Metal Products Co.
HUBBARD 2-1737
Millard Brass & Copper Co.
HIGHLANDS 2-6220
MICHIGAN
Detroit
Copper & Brass Sales, Inc.
FOREST 6-6200
Meier Brass & Aluminum Co.
JORDAN 6-3902
Grand Rapids
Copper & Brass Sales, Inc.
EMPIRE 1-4681
Kalamazoo
Bard Tool and Equipment Co.
FIRESIDE 3-2691
Lansing
Superior Brass & Aluminum Co.
IV 2-8754
Muskegon
Towne Hardware & Supply Co.
2-2651
MINNESOTA
Minneapolis
R. G. Eide, Inc.
FE 8-4846
MISSOURI
Kansas City
Associated Bearings Co.
HARRISON 1-0407
St. Louis
R. J. Bearing Co.
MISSION 7-3605
NEBRASKA
Grand Island
The Island Supply Co.
DUPONT 2-8567
Omaha
T. S. McShane Co., Inc.
JACKSON 1273
NEW JERSEY
Carlstadt
E. A. Williams & Son
GENEVA 8-0800
MARKET 3-1929
(New York LA 4-9546)
Newark
Federal Bronze Products, Inc.
MARKET 2-6330
Perth Amboy
Gregg's Brass Foundry
HILLCREST 2-2086
NEW YORK
Brooklyn
Hamsley, Inc.
STerling 8-1144
Buffalo
Kencroft Associates, Inc.
RIVERSIDE 1520
Rochester
Ontario Metal Supply, Inc.
HAMILTON 6-1630
Syracuse
Meloon Bronze Foundry, Inc.
GLENVIEW 4-3231
Troy
The Troy Belting & Supply Co., Inc.
AS 2-4920 (in Albany 3-6121)
OHIO
Akron
Akron Welding and Spring Co.
JEFFERSON 5-2187
Cleveland
Copper & Brass Sales, Inc.
VU 3-8100
The Bearing Bronze Co.
MICHIGAN 1-6520
Cincinnati
Reliable Castings Corp.
KIRBY 1-2627
Columbus
Williams & Co., Inc.
AXMINSTER 4-1623
Dayton
The Bristol Brass Corp. of Ohio
BALDWIN 8-6185
Toledo
The Seeger Brass Company
CHERRY 8-5321
Williams & Co., Inc.
GREENWOOD 5-8661
PENNSYLVANIA
Easton
R. T. Schaller Co.
BL 2-2435
Latrobe
Latrobe Foundry Machine & Supply Co.
KEYSTONE 7-3341
Philadelphia
Brass & Copper Sales, Inc.
GLADSTONE 7-2500
Renewal Service, Inc.
BALDWIN 9-6330
Pittsburgh
Pennsylvania Industrial Supplies Co., Inc.
ALLEGHENY 1-5810
Pittsburgh Brass Mfg. Co.
ATLANTIC 1-8761
RHODE ISLAND
Providence
Clifford Metal Sales Co., Inc.
UNION 1-4100
SOUTH CAROLINA
Greenville
J. M. Tull Metal & Supply Co., Inc.
CEDAR 3-8366
TENNESSEE
Memphis
Memphis Bearing & Supply Co.
JACKSON 6-7543
Nashville
Dixie Bearings, Inc.
CHAPEL 2-7351
TEXAS
Beaumont
Standard Brass & Mfg. Co.
TERMINAL 3-2641
Houston
Standard Brass & Mfg. Co.
RI 7-1220
Port Arthur
Standard Brass & Mfg. Co.
YUKON 5-9877
WISCONSIN
Milwaukee
Badger Bearing Co.
BROADWAY 2-0231
CANADA
Lachine, Quebec
Federated Metals Canada, Ltd.
MELROSE 7-3591
Scarborough, Ontario
Federated Metals Canada, Ltd.
PLYMOUTH 7-3246

Circle **4** on Reader Service Card



ASARCON 773

ORDER ASARCON CONTINUOUS-CAST BEARING BRONZE IN ANY LENGTH

ELIMINATE SHORT-END SCRAP, SAVE TIME, METAL AND MONEY

When you order Asarcon 773 (SAE 660) continuous-cast bearing bronze, you receive the exact length you specify. You choose from more than 260 stock sizes — solids and tubes — and have your order cut in any length you want up to 105″. You never have to include the cost of short end scrap in the price of your finished part, because Asarcon 773 eliminates the remnant problem.

By providing diameters close to your finished sizes, Asarcon further reduces the cost of scrap. With only 1/32″ to 3/32″ to machine off, there is more usable metal, machining time is reduced, work moves faster. Because it is produced by the unique continuous-cast process, Asarcon 773 has unusually high density. Every casting has more resistance to metal fatigue, superior hardness, higher tensile, yield and impact strength . . . and each is guaranteed free of blow holes, shrinks, voids, pits.

For further information, call or write your nearby distributor (see listing on opposite page), or write Continuous-Cast Department, American Smelting and Refining Company, Perth Amboy, New Jersey.

ASARCO

Circle **4** on Reader Service Card

LITERATURE

on drives and components

To get free copies of the following literature, use the Reader Service Cards bound into this issue.

V-belt drive guide

Catalog Section 50-C presents instructions and engineering data for selecting stock and non-stock drives. Lists over 400 stock sheave sizes for A, B, C, D, section V-belts. Sheave sizes from single groove 3-in., 3-lb model to 20-groove, 70-in., weighing more than 2800 lb. Specifications of multi V-belts of standard, standard, super and steel cable construction—A, B, C, D and E cross sections. Sixty-four pages. *Fort Worth Steel & Machinery Co., Fort Worth, Texas.*

Circle **300** on Reader Service Card

Flexible shaft assemblies

Catalog No. 574 covers over 180 variations of Circle Ess Standard shaft assemblies which can be ordered direct. Gives all necessary dimensions and ordering data for a wide variety of applications. *F. W. Stewart Corp., Chicago, Ill.*

Circle **301** on Reader Service Card

Right angle template kits

Template kits aid the designer to select the unit whose configuration, rpm, hp, and torque ratings suit his application. The kits are for use with company catalog which lists variations of 18 basic transmissions. Available through distributors. *Crown Gear Co., Worcester, Mass.*

Circle **302** on Reader Service Card

Flexible couplings

Complete specifications for power drive flexible couplings are shown by drawings and charts in Bulletin J-23. Details on clearance for alignment, dimensions, nominal and max. bore, hp capacity per 100 rpm, net weight, oil capacity and max. rpm. Types described are: double engagement, mill motor, single engagement, standard double engagement, extended, standard mill motor, standard single engagement, standard extended and style AA. *Hewitt-Robins, Jones Machinery Div., Stamford, Conn.*

Circle **303** on Reader Service Card

Endless woven belts

Envelope-brochure contains 8 pages on continuous high speed transmission belts of the endless woven type. Belts are available flat, round and stitched in a variety of materials including ones with elastic cores. Brochure includes order/specification form. *Arthur S. Brown Mfg. Co., Tilton, N. H.*

Circle **304** on Reader Service Card

AC motors

Full color Bulletin B-2515 shows the complete line of Duty Master ac motors from 1 to 2000 hp. Outlines product features of each motor and explains selection system. Also describes production facilities. *Reliance Electric and Engineering Co., Cleveland, Ohio.*

Circle **305** on Reader Service Card

Right angle worm gear motors

Brochure No. F-1971 highlights the single reduction Type GW Sycrogear and the double reduction Type GWB. Ratings and dimensions for both. Speeds of 3.25 to 230 rpm (positive speed reduction gives standard AGMA output speeds) and gear ratios to 87:1. Ratios up to 354:1 for Type GWB. HP ratings are ⅓, ½, ¾, 1, 1½, and 2 hp. Specialized models and optional mountings and assembly positions also illustrated. *U. S. Electrical Motors, Inc., Los Angeles, Calif.*

Circle **306** on Reader Service Card

Ring sprockets

Bulletin No. 1606 contains comprehensive listings of stock ring sprockets for each of seven series of chains from 1.5 in. pitch through 4.063 in. pitch. Bore sizes from 36 in. through 100 in., diam. from 44 in. through 106 in. *Cogmatic Div., American Marietta Co., Milwaukee, Wis.*

Circle **307** on Reader Service Card

Selective plating

Bulletin SP 1003 lists industrial uses and advantages of a new high speed selective plating process. Called the Selectron process, it plates selected areas of components without having to immerse the entire object. *Selectrons, Ltd., New York, N. Y.*

Circle **308** on Reader Service Card

Torque motors

Bulletin 208A lists motors from 1.5 to 96 ft oz, in designs of 110 to 550 v, 1, 2, and 3 phase ac; and 115, 230 v dc. Contains speed torque curves, duty specifications and a wide range of ratings. *Ohio Electric Co., Cleveland, Ohio.*

Circle **309** on Reader Service Card

Takeups

Book 2741, 16 pages, covers a complete line of takeups, in seven frame styles, equipped with sleeve, ball or roller bearings. The 320 units listed include the new LC and LH multi-bearing frames for direct mounting of a large variety of ball, roller, babbitted or bronze pillow blocks. Information on application, with dimensional data for each frame. *Link-Belt Co., Chicago, Ill.*

Circle **310** on Reader Service Card

Variable speed catalog

Catalog has 112 pages on lube-free integral and fractional hp variable speed drives. Cutaway draw-

ings and photos detail working parts. Illustrates integral and fractional modifications, including single, double and triple reductions, as well as horizontal single and double worm assemblies. Price section covers 2:1 to 6:1 variations and max. variations. *Sterling Electric Motors, Inc., Los Angeles, Calif.*

Circle **311** on Reader Service Card

Automatic engine controls

Series 46 and 56 controls automatically stop and start gas, gasoline and diesel engines, by a remote set of electrical contacts, if oil pressure falls, water temperature rises or engine overspeeds. Individual signals show what caused failure. Complete details in Bulletin 601. *Synchro-Start Products, Inc., Skokie, Ill.*

Circle **312** on Reader Service Card

Torque control couplings

Flyer gives details of transmission-type coupling with an automatic

Circle **22** on Reader Service Card

Quality Clutches Exclusively

These **Over-Center Clutches** are General Purpose, heavy duty, friction clutches for machines requiring high quality dependable clutches with low power losses, low upkeep, and long life. Built in *Flex-Disc,* Solid Disc (two halves), and Gear Tooth types.

Five sets of over-center toggles provide two to three times greater bearing surface. Easily adjusted for wear by releasing latch and turning toggle assembly.

We offer a complete Clutch Engineering and Manufacturing Service — designing, producing, and applying clutches to meet any conditions arising in industry.

INDUSTRIAL CLUTCH CORP.

515 Frederick St. · Phone LIberty 7-3359 · Waukesha, Wis.

WHAT'S YOUR PROBLEM?

Is it any of the following?

- Diminishing output due to a progressive drop in rpm.
- Too much down-time because of the need for frequent adjustment due to belt stretch.
- Excessive maintenance time and expense.
- Poor belt and bearing life.
- A drive in an inaccessible or isolated location.
- A high-ratio short-center drive.

MOUNTING THE MOTOR ON AN "AUTOMATIC" BASE MAY PROVE TO BE A SIMPLE AND ECONOMICAL SOLUTION

Motor mounting position and direction of pulley rotation are immaterial.

Stock Sizes
¼ to 125 HP.
for NEMA frames
56 through 505
and 445-U

Larger Sizes
for motors
up to 500 HP.
and for motors
having one or
two outboard
bearings.

AUTOMATIC MOTOR BASE CO.
WINDSOR, N. J.

Circle **6** on Reader Service Card

MOLYKOTE® M-88
BONDED LUBRICANT COATING

FREE SAMPLE!

Handy Applicator Bottle • Enough Lubricant to coat parts for evaluation • Absolutely FREE! • New industrial lubricating technique • Simply apply like a paint • Allow to air dry • Provides 100% safety against galling and seizing • Smooth, protective lubricating film bonds to most surfaces • Lifetime lubrication in many applications • Mail the coupon today.

THE ALPHA-MOLYKOTE CORP.
65 HARVARD AVENUE • STAMFORD, CONN.

The Alpha-Molykote Corp., 65 Harvard Ave., Stamford, Conn.
Please send me a FREE SAMPLE of MOLYKOTE M-88. PTD-6

Name _____ Title _____
Company _____
Address _____
City _____ Zone _____ State _____

Circle **7** on Reader Service Card

LITERATURE

tripping unit and limit switch. Overload of a pre-set torque limit slips the clutch and a dual cam operating ring actuates the limit switch arm and shuts off power to the motor. After the overload is released and power turned on, coupling can continue full load operation without torque readjustment. Max. shaft size 3¼ in., torque capacities from 10 in. lb to 550 ft lb. *Buffalo Machinery Co., Buffalo, N. Y.*

Circle **313** on Reader Service Card

Miniature bronze bearings

Catalog shows expanded line of miniature precision sintered bronze bearings. Both flanged and sleeve bearings in bores from .025 to .3127 in. Bores, outside diam., concentricity and facial squareness maintained to tolerance of .0002 in. Bearings are sintered with molybdenum disulphide and vacuum-impregnated with instrument oil. *Northfield Precision Instrument Corp., Island Park, N. Y.*

Circle **314** on Reader Service Card

Mechanical conveyors

New catalog section, 8-pages, fully illustrated, offers complete data descriptions and specifications of light, medium and heavy tonnage mechanical conveyors. *Syntron Co., Homer, Pa.*

Circle **315** on Reader Service Card

Variable speed equipment

Section B to Catalog No. 61 includes variable speed belts, sheaves, pulleys; tilting, standard and counter shaft motor bases and complete transmissions. Section drawings, tabulated data, and tables of representative applications for each pulley type. *Lovejoy Flexible Coupling Co., Chicago, Ill.*

Circle **316** on Reader Service Card

AC and variable speed drives

Bulletins B-031 and B-231 cover ac and dc adjustable speed drive package systems. B-031 features dc drive motors, 1-150 hp, Type MG complete drive systems, Type BT thyratron converter and Type AT anode transformer Selectron. Bulletin B-231 covers ac drives of 1 to 100 hp, using solid rotor motors, NEMA design D motors, wound rotor motors and magnetic amplifier controls. *Electro Dynamic Div., General Dynamics Corp., Bayonne, N. J.*

Circle **317** on Reader Service Card

Speed measurement systems

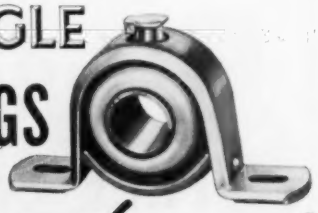
Bulletin GEZ-3251, 12 pages, describes a complete line of ac and dc tachometer generators and indicators. Information on instruments' applications, calibration, accuracy and method of selection. Specifications, schematics, and photos of the measurement systems described. *General Electric Co., Schenectady, N. Y.*

Circle **318** on Reader Service Card

Industrial torque converters

Four-page folder, Form C270, describes new 12 and 13 in.-wheel C270 series industrial torque con-

TRIANGLE BEARINGS with Engineered INDIVIDUALITY



Triangle fits the bearing to the application. Whether you can use a standard, like the Pillow Block above, or need a special such as the Pedestal or Clamshell Bearings shown below, your particular bearing problem receives the individual attention best assuring cost reductions — quality improvements.

SELF-ALIGNING . . . SELF-LUBRICATING SLEEVE-TYPE PILLOW BLOCKS

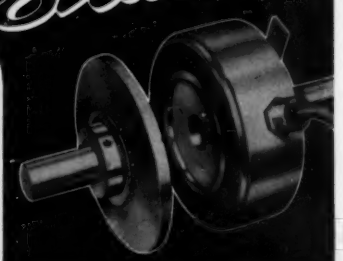
The widest selection of mountings available — functionally designed, efficiently produced. Experienced sales engineers available to help you anywhere. Phone or write for descriptive literature.

TRIANGLE MANUFACTURING CO.
734 Division St. Oshkosh, Wisconsin

Circle **41** on Reader Service Card

... another NEW product from Stearns

NOW AVAILABLE–
540 lb-in. Torque Miniature Clutch
Model 5.5
Style SMR*
Diameter—5⅜"
Depth—2¼"
Max. VDCW–115
Max. Watts—26
Weight—12 lb

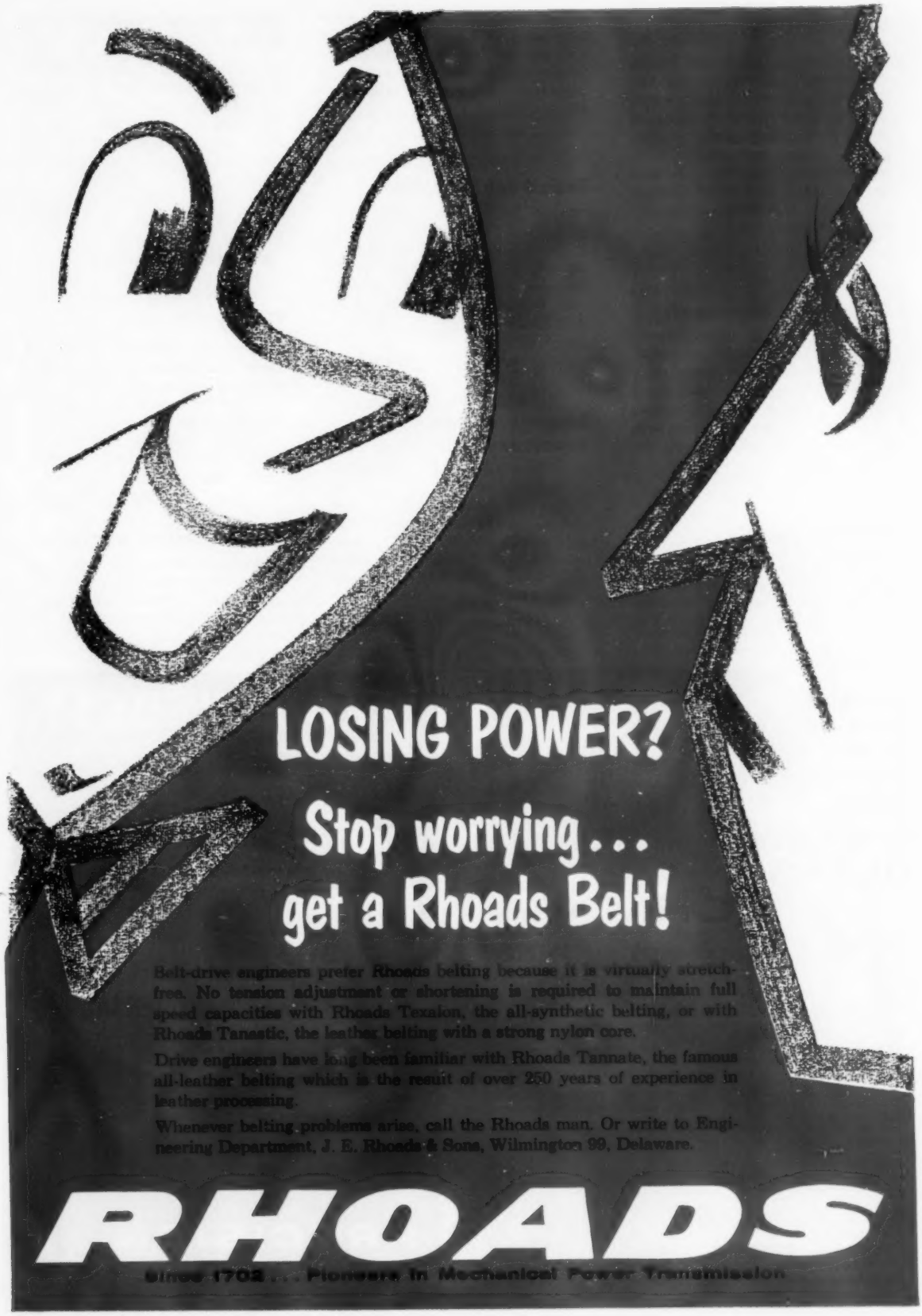


MORE TORQUE PER POUND—weighs 24%—63% LESS . . . MORE TORQUE PER CUBIC INCH—occupies 19%—64% LESS cubic area . . . than other standard clutches of similar torque rating!

*Ball bearing mounted rotor, and stationary magnet body eliminate alignment problems—speed installations. For high torque, high speed, minimum size and weight requirements. Request Stearns New Product Preview No. 1-61-C.

Stearns ELECTRIC CORPORATION
SINCE 1912–THE CHOICE OF LEADING MOTOR AND MACHINERY MANUFACTURERS

Circle **39** on Reader Service Card


LOSING POWER?
Stop worrying...
get a Rhoads Belt!
Belt-drive engineers prefer Rhoads belting because it is virtually stretch-free. No tension adjustment or shortening is required to maintain full speed capacities with Rhoads Texalon, the all-synthetic belting, or with Rhoads Tanastic, the leather belting with a strong nylon core.
Drive engineers have long been familiar with Rhoads Tannate, the famous all-leather belting which is the result of over 250 years of experience in leather processing.
Whenever belting problems arise, call the Rhoads man. Or write to Engineering Department, J. E. Rhoads & Sons, Wilmington 99, Delaware.
RHOADS
Since 1702 . . . Pioneers in Mechanical Power Transmission

LITERATURE

verters for heavy-duty lift trucks, tractors etc. Input hp up to 125 hp. Torque input of 12-in. wheel rated at 200 ft lb, 13-in. wheel at 270 ft lb. Cutaway section, dimensioned interior and exterior drawings and a selection chart of input hp and rated rpm. *Clark Equipment Co., Automotive Div., Buchanan, Mich.*

Circle **319** on Reader Service Card

Precision components

Loose-leaf data file has sheets on plate processing, toothed wheels and gears, pinions and arbors, small screws and threaded parts, flat and irregular shaped parts. Describes supporting services offered. *Hamilton Watch Co., Lancaster, Pa.*

Circle **320** on Reader Service Card

Geared flexible couplings

Folder 2975 on Type MC geared flexible motor couplings includes details on three new features added to the line—an anti-corrosion cover, a spacer adapter, and a larger size that extends the range of the couplings up to a 2⅞ in. bore size. *Link-Belt Co., Chicago, Ill.*

Circle **321** on Reader Service Card

Sound lab. facilities

"Sound Analysis for Product Improvement," Bulletin 51B9775, describes lab facilities to make audible sound or structure-borne vibration measurements on self-powered and electrically operated machines. *Allis-Chalmers Mfg. Co., Milwaukee, Wis.*

Circle **322** on Reader Service Card

Electric motor dynamometer

Spec sheet deals with a new pocket dynamometer for measuring torque and power loading of small eletcric motors in the field. Two models—No. 63 and No. 75. Manufacturer claims accuracy of instrument within ½ of 1%. *Micropump Corp., Danville, Calif.*

Circle **323** on Reader Service Card

High speed transmission belts

Brochure US 12 59 details dimensions, hp capacity and prices of a line of high speed endless belts. The belts are said to have successfully withstood speeds up to 145,000 rpm on pulley diameters as small as ¾ in. Widths from fractional to 5 in. Shrinkage nil, stretch less than ½%. *Russell Mfg. Co. Middletown, Conn.*

Circle **324** on Reader Service Card

Timing screws

Illustrated Brochure STE-596 shows the engineering principles of timing screws for picking containers from a conveyor and discharging them at a required spacing. Line drawings and photos. *Arthur Colton Co., Detroit, Mich.*

Circle **325** on Reader Service Card

Thread rolled worms

Booklet called "Design ABC's of Rolled Worm Threads", lists the advantages of thread rolling over cutting, grinding and hobbing. Il-

Is one of these Drive Problems YOURS

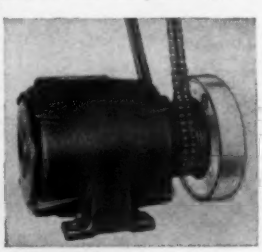
?

- Smoother High-Inertia Starts
- Excessive Loads
- Controlled Acceleration
- Dynamic Braking
- Partial or Full Stall

You need GLEASON-TORMAG® Magnetic DRIVES

Here's dependable *drive protection* that can save you money. The new GLEASON-TORMAG Magnetic Drive on your equipment provides frictionless, shockless drive, dependable controlled torque, high-slip or continuous stall operation, smoother cushioned starts, . . . a combination of advantages achieved in no other type of drive.

Uniquely simple in design and construction, operating through eddy currents developed by permanent magnets, GLEASON-TORMAG Drive delivers high efficiency at rated horsepower under full operating loads. No power loss in fluids, or particles or in mechanical friction. Can be used as an "in line" or "take off" drive with flexible couplings, chains, sprockets, belts. Standard sizes range from 1 to 10 H.P., at 1750 RPM. Also Custom-engineered in fractional, and up to 30 H.P. Write on company letterhead for new catalog No. TP260.



TORMAG DIVISION
GLEASON REEL CORP.
738 N. Plankinton Ave., Milw. 3, Wis.
Representatives in Principal Cities in U.S. and Canada.

Circle **42** on Reader Service Card

PROVEN BEST
IN THOUSANDS OF APPLICATIONS

PRECISION UNIVERSAL JOINTS
PTD-61

Made from high quality aircraft steel, machined to extremely close tolerances. Interchangeable parts . . . specially heat treated to a uniform hardness throughout. Available blank, bored, broached, threaded, cross drilled or tapped to your exact specifications.

PRECISION
PRECISION TOOL & MFG. CO. OF ILLINOIS
1305 S. LARAMIE AVENUE / CICERO 50, ILLINOIS

clip this ad to your letterhead!

PTD-61

Circle **31** on Reader Service Card

lustrates and describes general design rules. *Landis Machine Co., Waynesboro, Pa.*

Circle **326** on Reader Service Card

Bearing catalog

Said to be the most complete catalog and technical handbook yet on miniature ball bearings. Sixty-four pages on more than 500 types and sizes of miniature and instrument-size bearings and bearing products. Half the contents consist of a reference handbook with chapters on bearing selection materials, load rating, torque and vibration testing and lubrication. Other sections include failure analysis, special bearings, etc. *Miniature Precision Bearings, Inc., Keene, N. H.*

Circle **327** on Reader Service Card

Range drives

Brochure No. F-2028 deals with the application of Varidyne all-ac controlled speed systems to range drives for paper, fabric, plastic and metal strip. Gives typical schematics for both tension control and tensionless operation. Subjects covered include starting the range, changing speed of the line, stopping the line, system braking, etc. *U. S. Electrical Motors, Inc., Los Angeles, Calif.*

Circle **328** on Reader Service Card

Instrument motors

Brochure describes construction and operation of different types and models of instrument motors. Includes dimensional drawings, rating charts, wiring diagrams, listings and photos. Special sections on service, testing procedures and application guidance. *Bodine Electric Co., Chicago, Ill.*

Circle **329** on Reader Service Card

Synchro data sheet

Data Sheet CS/TS-6-23-1 gives detailed specifications for rapid selection of Size 23, 60-cycle Thru Bore synchros for servo applications. More than 25 characteristics listed for transformers, transmitters, differential transmitters and receiver transmitters engineered to MIL-S-20708A. Schematic drawings, dimensions and wiring diagrams. *Vernitron Corp., Carle Place, L. I.*

Circle **330** on Reader Service Card

Electrical machinery catechism

Newly-revised, 48-page, "Catechism of Electrical Machinery" presents in a simple form the most important theoretical and practical features of the common types of ac and dc motors, generators and control equipment. Well illustrated. *Fairbanks, Morse & Co., Electrical Div., Freeport, Ill.*

Circle **331** on Reader Service Card

Selsyn indicating systems

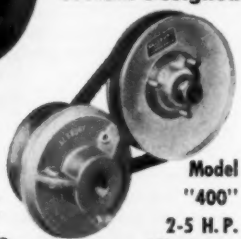
Bulletin GEA-7218, 6 pages, gives data for remote control and remote indication. Details some possible applications of the selsyn monitoring system. Lists several of the indicator arrangements available, such as geared indicators, digital counter-type readouts, etc. Also describes use of cam operated limit switch as an automatic feedback control. Gives specification tables to select dial type, degree of accuracy needed, appropriate indicators and transmitters. Diagrams show approximate dimensions. *General Electric Co., Schenectady, N. Y.*

Circle **332** on Reader Service Card

SALSBURY
AUTOMATIC CLUTCHES AND TRANSMISSIONS

MODELS FOR ANY APPLICATION From Stock, or Custom-Designed

Centri-Dyne Clutches 6-100 H.P.



Model "400" 2-5 H.P.

For gasoline engines, gas turbine engines, electric motors. Designed to rigid specifications; engineered and operation-tested to meet highest performance standards. Approved by leading manufacturers. Confidential engineering assistance without obligation.

Model "600" 6-10 H.P.

SALSBURY CORPORATION "Since 1936"

1161 E. Florence Ave., Los Angeles 1, Calif.

Circle **35** on Reader Service Card

Don't take chances on couplings

CHECK PUBLISHED MISALIGNMENT RATINGS BEFORE YOU BUY

Since misalignment is the basic problem that shaft couplings are designed to solve you'll find a published conservative misalignment rating (along with load capacity rating) for every Fast's Coupling. Compare it with the misalignment rating of any other coupling you are considering.

One further advantage of Fast's Couplings' misalignment ratings: You save money on installation because, knowing the ratings, you don't have to line up driving and driven elements with pinpoint accuracy. It's one more important reason why Fast's Couplings are the choice of more equipment manufacturers than any other gear-type coupling.

KOPPERS COMPANY, INC., 906 Scott Street, Baltimore 3, Md.

KOPPERS **FAST'S COUPLINGS**

Engineered Products Sold with Service

Circle **24** on Reader Service Card

MEN

of the power transmission field

Leading physicist elected director of AMF

Seitz

Dr. Frederick Seitz, head of the Physics Department of the University of Illinois, has been elected a director of the American Machine and Foundry Co.

Dr. Seitz is currently president of the American Physical Society, the country's largest organization of physicists devoted to teaching and research in education, government and industry. An international authority on solid state and nuclear physics, he is the author of several books and over 150 articles.

AMF expect that Dr. Seitz's scientific experience will be especially valuable in the fields of water desalinization and nuclear energy.

Among other positions, Dr. Seitz directed the first training program in atomic energy at Oak Ridge National Laboratory in 1946 and 1947. He joined the University of Illinois in 1949, serving successively as professor of physics, director of the control systems laboratory and head of the Department of Physics.

Rockwell-Standard names executive vice presidents

Newly elected executive vice presidents of the Rockwell-Standard Corp. are Harry Fante and F. W. Parker, Jr.

Fante, long a director and vice president of the Corporation, has for many years headed the Automotive Seating Group, and is also president of Aero Commander, Inc., a wholly owned subsidiary.

Parker headed the Corporation's largest operating division, the Transmission and Axle Group.

Brammer appoints mid-west manager

Brammer V-Link Belting appointed Christian F. Johnson their mid-west district manager. He will work out of Chicago.

Johnson is thoroughly experienced in the belting field. He was formerly a district manager for the Manheim Mfg. Co.

New plant management team at Boston Gear Works

Boston Gear Works Division, The Murray Company of Texas, Inc., announced two plant management staff promotions.

Edward F. Cannon, former general superintendent of the Quincy plant, has been appointed works manager. Alec D. Shaw replaces Cannon as general superintendent.

Shaw

Cannon

Shaw was previously assistant superintendent of the Boston Gear Works, but has served for the past two years as general manager of the Compressed Steel Shafting Co., a subsidiary of The Murray Company.

Kuzmick Raybestos-Manhattan vice president

Joseph N. Kuzmick, divisional manager of Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J. and director of the corporation, was elected vice president at the Directors Meeting following the Annual Stockholders Meeting.

Kuzmick was appointed divisional manager of the Manhattan Rubber Division in April 1959 and elected a director of the Corporation in April 1960. Previously Kuzmick was co-ordinator of Corporation Research and Development activities. He has been with Manhattan for 42 years, having started in 1919. He was active for many years in the development of abrasive and diamond wheels, synthetic resins, plastic products, bowling balls, railroad brake blocks, brake linings, and sintered metal friction products.

To manage Warner research facility

Ruffner

Leland W. Ruffner, formerly with Stewart-Warner Corporation, has been appointed manager-engineering and research for Warner Electric Brake & Clutch Company, Beloit, Wisconsin.

Ruffner will be responsible for the company's design engineering, project engineering, drafting, automotive and industrial test laboratories, and its research and development facility.

Before coming to Warner Electric, Ruffner, was employed for 13 years by Stewart-Warner in Indianapolis, serving in a number of positions including assistant to the chief engineer, production supervisor and industrial engineering supervisor.

He received his B. S. degree in mechanical engineering from Purdue University. He joined Warner Electric two and one-half years ago as manager, quality control.

Navy scientist receives ASLE National Award

The Awards Committee of the American Society of Lubrication

Engineers has named Dr. W. A. Zisman to receive the 1961 ASLE National Award. Dr. Zisman is Superintendent of the Chemistry Div. of Naval Research Laboratory, Washington, D. C. and a member of several scientific societies.

The National Award is ASLE's highest honour. Dr. Zisman's work on synthetic lubricants and fire resistant hydraulic fluids qualified him for the Award.

Appointed Hewitt-Robins manager in Cleveland

Van Stone

J. E. Van Stone has been appointed Cleveland district manager for Hewitt-Robins Inc., with responsibility for the marketing of conveyor machinery, power transmission equipment and industrial rubber products in Cleveland, Toledo, Youngstown, Columbus, Dayton, Cincinnati and surrounding areas.

Van Stone was formerly in charge of sales in the Salt Lake City area. He has been in the mining industry for many years. Until the time of his new appointment he was a member of the executive committee, Utah section, American Institute of Mining. He is a member of the Metalurgical and Petroleum Engineers and American Institute of Steel Engineers.

Formsprag appoints project engineer

New project engineer for Formsprag's Rawson line of centrifugal clutches is Joel G. Bussel.

Formerly a test engineer at Huck Mfg. Co., Detroit, Bussell holds a B.S.E. in mechanical engineering from the University of Michigan. He is a member of ASME, SAE and the Society of Experimental Stress Analysis.

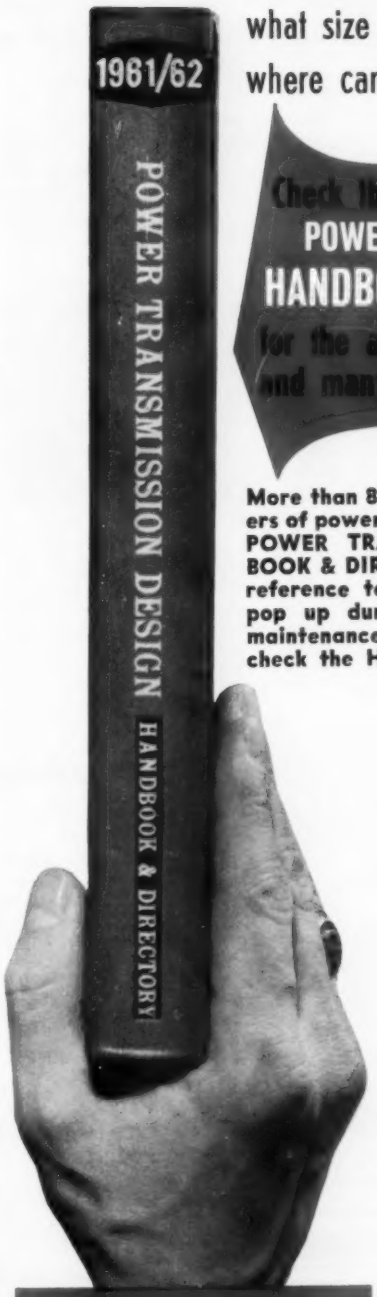
De Laval elects director

James C. Kellogg III was elected a director of De Laval Steam Turbine Company at the company's Annual Meeting held in April.

continued on page 62

what about its design?
who makes it?
what size does it come in?
where can I buy it?

Check the
POWER TRANSMISSION DESIGN
HANDBOOK & DIRECTORY
for the answers to these questions and many more.



YOUR ALL-PURPOSE POWER TRANSMISSION REFERENCE

More than 80,000 design engineers and buyers of power transmission products keep the POWER TRANSMISSION DESIGN HANDBOOK & DIRECTORY handy. It's their quick reference to the countless questions that pop up during design, specification and maintenance activities. They specifically check the HANDBOOK & DIRECTORY for:

ENGINEERING DATA—Helpful, time-saving standards, nomographs, formulas, and product designs.

MANUFACTURING INDEX—alphabetical listing of more than 800 producers of power transmission products.

PRODUCT DIRECTORY—quick, easy reference to more than 400 different power transmission items.

TRADE NAMES—helpful cross reference to manufacturers.

CATALOG DATA—condensed manufacturers' spec data for evaluating and selecting components, assemblies, systems and materials for specific applications.

LOCAL SOURCES—a handy index to more than 2000 local outlets for speedy selection of suppliers.

A limited supply of registered copies is available @ $12.00.

compiled by the editors of
POWER TRANSMISSION DESIGN
an Industrial Publishing Corporation magazine
812 Huron Road ● Cleveland 15, Ohio

MEN

Kellogg is senior partner in the stock-broker firm of Spear, Leeds and Kellogg, New York City; vice chairman of the Port of New York Authority; and was formerly Chairman of the Board of Governors of the New York Stock Exchange. He is also an officer and director of other industrial and financial corporations.

Zimmerman is Raybestos-Manhattan executive v.p.

S. R. Zimmerman Jr., was appointed the executive vice president of Raybestos-Manhattan at an early board of directors meeting. He is also a director and vice president of the Corporation, general manager of the United States Asbestos-Grey Rock Div. at Manheim, and in charge of operations of the Pacific Coast Div. at Fullerton, Calif. and director of Cassiar Asbestos Corp., Ltd., in Canada.

A graduate of Yale, Zimmerman joined the U.S. Asbestos-Grey Rock Div. in 1932 as an engineer. He has been manager of Automotive and Industrial Sales for the Division and director of friction material research and development for the Corporation.

Maurey adds two to sales staff

Robert G. Cahill and Donald G. Murphy have been appointed to the Maurey Manufacturing Corporation's sales organization. Cahill,

Cahill

Murphy

who will represent Maurey in the Dallas area, is well known to power transmission men throughout the South West. He has twenty six years of experience in the power transmission problems of oil and gas installations, air-conditioning, cotton gin and oil mill installations in that area.

Murphy will represent Maurey in the northern half of the city of Chicago and through five counties of Northeastern Illinois. He comes to Maurey's Chicago headquarters from Kansas City where he was also engaged in power transmission sales.

New advertising manager for Timken

John H. Fellows succeeds Norman H. Peterson as Timken's advertising manager.

Holder of a degree in mechanical engineering from Ohio State, Fellows Joined Timken in 1949 as a sales engineer. Before his promotion, he held the position of sales promotion and manager of college relations.

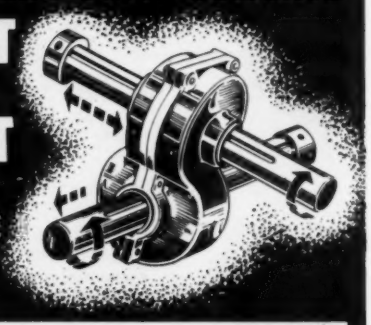
He is a registered professional engineer, member of SAE, ASME, and other professional associations.

Peterson, who joined Timken as a copywriter in 1946, now becomes assistant to the president. He is a graduate of Illinois University.

THE MOST FLEXIBLE RIGHT ANGLE GEAR DRIVE DESIGNED

FLOAT -a- SHAFT

UNIVERSAL RIGHT ANGLE GEAR DRIVE COUPLING



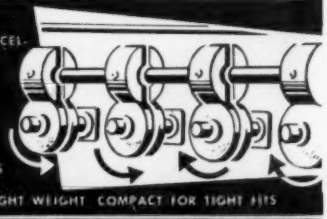
New, versatile gear drive designed to meet the needs of many applications requiring power transmission at right angles with a 1:1 ratio.

Easy to install, the floating feature of the unit permits self-alignment on the driving and driven shafts.

Ideal for operating packaging equipment, farm machinery, conveyors, rollers and all types of industrial equipment.

FEATURES

- FLOATS ON SHAFT FOR EXCELLENT ADAPTABILITY TO DIFFERENT MACHINES
- EASY TO INSTALL NO COUPLINGS NEEDED
- SELF-ALIGNING
- HIGH HORSEPOWER AND TORQUE CAPACITY
- HARDENED HELICAL GEARS FOR RUGGED OPERATION
- ALUMINUM HOUSINGS LIGHT WEIGHT COMPACT FOR TIGHT FITS



Tol-O-Matic, Inc.

245 Tenth Avenue South • Minneapolis 15, Minn

Circle **40** on Reader Service Card

Money Isn't Everything

But it's a big part of what you can get by entering the 1961 Fluid Power Prize Paper Contest sponsored by Hydraulics and Pneumatics Magazine. Cash awards total $1400. Along with the money, you get recognition for yourself and your company—awards are presented at the National Conference on Industrial Hydraulics in October. Papers are published in Hydraulics & Pneumatics.

You can submit a paper dealing with any phase of product or equipment development, new applications, circuit and component design, or fundamentals.

This is a contest of ideas, not writing ability. Use photographs, drawings, tables, or graphs to help your presentation.

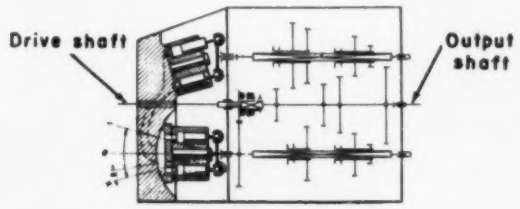
Circle Reader Service No. 50 for details

PATENTS

Mechanical Power Converter

U. S. Patent No. 2,962,915; Georg Wiggermann, Kressbronn, Germany, assignor of ½ to Walter Reiners, M.-Gladbach, Germany.

Mechanical torque converter is capable of infinite ratio changes without interrupting power transmission. Two countershafts each have constant-step ratio changing gears, and an auxiliary drive that can change



the speed ratio from 1 to value of this constant ratio. The auxiliary drives have two members that may be operated as input or output members, simultaneously, during ratio shifting.

Flexible Coupling

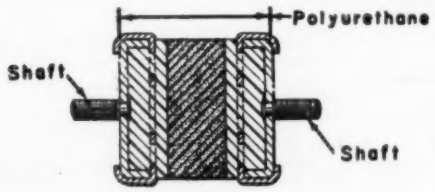
U. S. Patent No. 2,892,327; William E. Kressin, Watertown, Wis.

Two parts of a flexible coupling are identical; the coupling may turn in either direction. Each half has angularly spaced, radial teeth, that can interlock with the other half. Made of rubber composition, the halves are sufficiently resilient to maintain total contact through a range of shaft misalignments.

Coupling Device

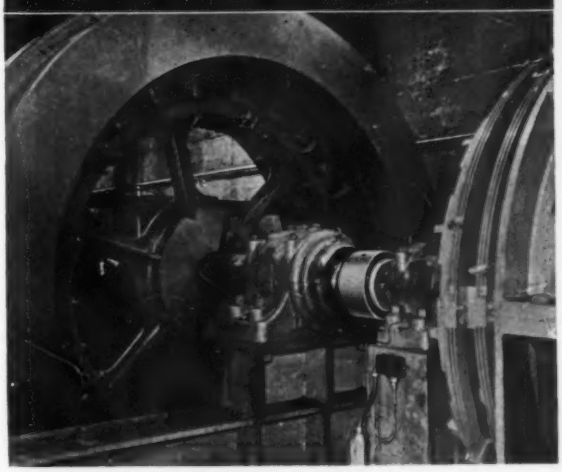
U. S. Patent No. 2,969,656; Franz Gottfried Reuter, Lemforde, Germany, assignor to Mobay Chemical Co., Pittsburgh, Pa.

A flexible coupling in which two metallic end-plates are connected by a polyurethane body. The poly-



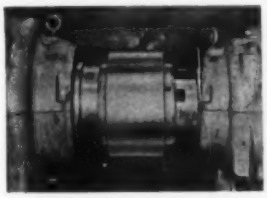
urethane has two nonporous end-portions and a porous central section.

Watching Your Weight?



Shave 250 lbs. in your next power transmission coupling design—with *no* sacrifice in performance.

Chandeysson Electric Company of St. Louis, Missouri, checked six coupling designs before specifying Sier-Bath flexible couplings on their DC motor generator sets for electroplating equipment used in steel mills. Of the six designs investigated which met their performance requirements (1250 H.P. @ 300 RPM through a 5¾" shaft), standard Sier-Bath couplings were almost 250 lbs. lighter than the *next* lightest coupling.



Not only are Sier-Bath couplings lighter and stronger than other designs, but they have the highest factor of safety and cost $75.00 *less* than the next lowest priced unit. The comparison chart below tells the complete story.

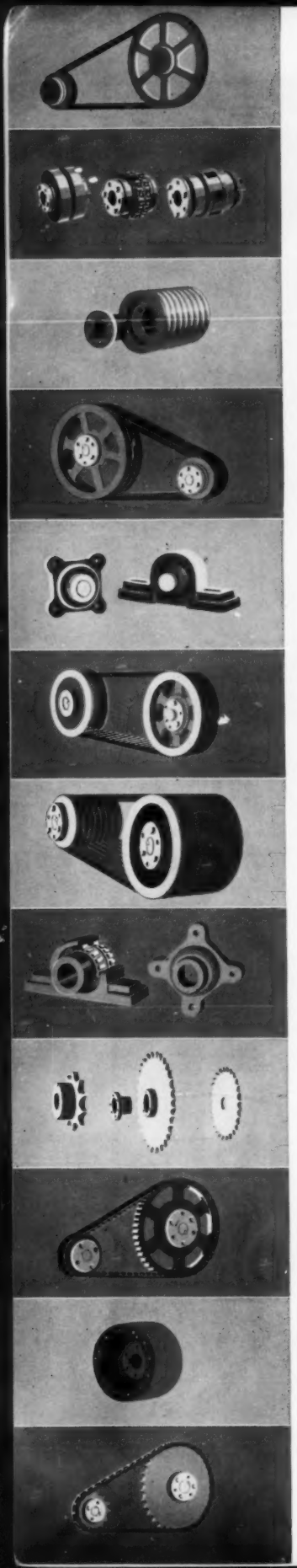
APPLICATION—DC Generator with 5¾" Shaft; 1250 HP at 300 RPM						
SPECIFICATION	Sier Bath	Coupling A	Coupling B	Coupling C	Coupling D	Coupling E
SIZE	5½	6	6	6	6	11
MAXIMUM BORE (inches)	6	6	6⅛	6⅛	6½	11
AVAILABLE HP CAPACITY FOR APPLICATION	1500	1800	1650	1350	1575	1600
LENGTH (inches)	8¼	16	12⅛	13 5/16	12 11/16	20¼
DIAMETER (inches)	11¼	16 5/16	17⅛	15¼	16 5/16	32⅛
WEIGHT (lbs.)	153	650	400	500	525	1990
FACTOR OF SAFETY	7	6	5	6	6	5
PRICE	$360	$643	$435	$435	$602	$900

For Engineering Information on Industry's Most Complete Flexible Coupling Line—Send for Your Catalog Today!

Sier-Bath
GEAR AND PUMP CO., INC.
FLEXIBLE COUPLING DIVISION
9252 HUDSON BLVD., NORTH BERGEN, N. J.

Member A.G.M.A.
Founded 1905

Circle **48** on Reader Service Card



1886 **Browning** 1961

our

75th

year

From the wood split pulley of 1886, to the most modern and efficient power transmission components of the 60's . . . the emphasis at Browning always has been on superiority of product and service. Our program of continuous search for new designs and improved methods is evidenced by the many innovations in the present Browning line.

This is industry's most convenient one-stop shopping center, including

- Gripbelt V-Drives
- Roller Chain Drives
- Gearbelt Drives
- Bearing Units
- Couplings
- FHP V-Drives
- Paper Pulleys
- Poly-V Drives

Plus many others . . . thousands of items off distributors' shelves, ready to use.

You may be sure that the many accomplishments of these first 75 years are but indications of much progress yet to come. We invite you to share with us this progress! BROWNING MANUFACTURING COMPANY, MAYSVILLE, KENTUCKY.
Write for General Catalog GC101

Browning

POWER TRANSMISSION EQUIPMENT

Circle **11** on Reader Service Card

ADVERTISERS INDEX

Acme Chain Corp. 12
Alpha-Molykote Corp. 55
American Biltrite Rubber Co.
Boston Woven Hose and Rubber Div. 11
American Pulley Co. 5
American Sealants Co., Inc. 46
American Smelting & Refining Co. 52, 53
Atlas Chain & Mfg. Co. 4
Automatic Motor Base Co. 55

Bond Co., Charles 13
Browning Mfg. Co. 64
Bunting Brass & Bronze Co. 32

Chain Belt Co. 9

Diamond Chain Co., Inc. 14

Eaton Mfg. Co.
Cleveland Worm & Gear Div. 27
Eaton Mfg. Co.
Dynamatic Div. 16
Elliott Mfg. Co. 10

Federal Bearings Co., Inc. 38

Gates Rubber Co. ..... Cover III
Gear Specialties, Inc. 31

Hi-Lo Mfg. Co. 13
Horsburgh & Scott 15

Industrial Clutch Corp. 55

Koppers Co., Inc. 47, 59

Locke Steel Chain Co. 47

Maurey Mfg. Corp. 1
Minster Machine Co. 25

National Pneumatic Co., Inc.
Janette Motor Div. 51
Nice Ball Bearing Co. 46

Orange Roller Bearing Co. 43

Precision Tool & Mfg. Co. 58

Raybestos-Manhattan
Manhattan Rubber Div. 7
J. E. Rhoads & Sons 57
Rockford Clutch Div.,
Borg-Warner Corp. 2

Salsbury Corp. 59
Schatz Mfg. Co. 42
Sier-Bath Gear & Pump Co. 63
Simonds Gear & Mfg. Co. 50
Simplatrol Products Corp. 6
Stearns Electric Co. 56

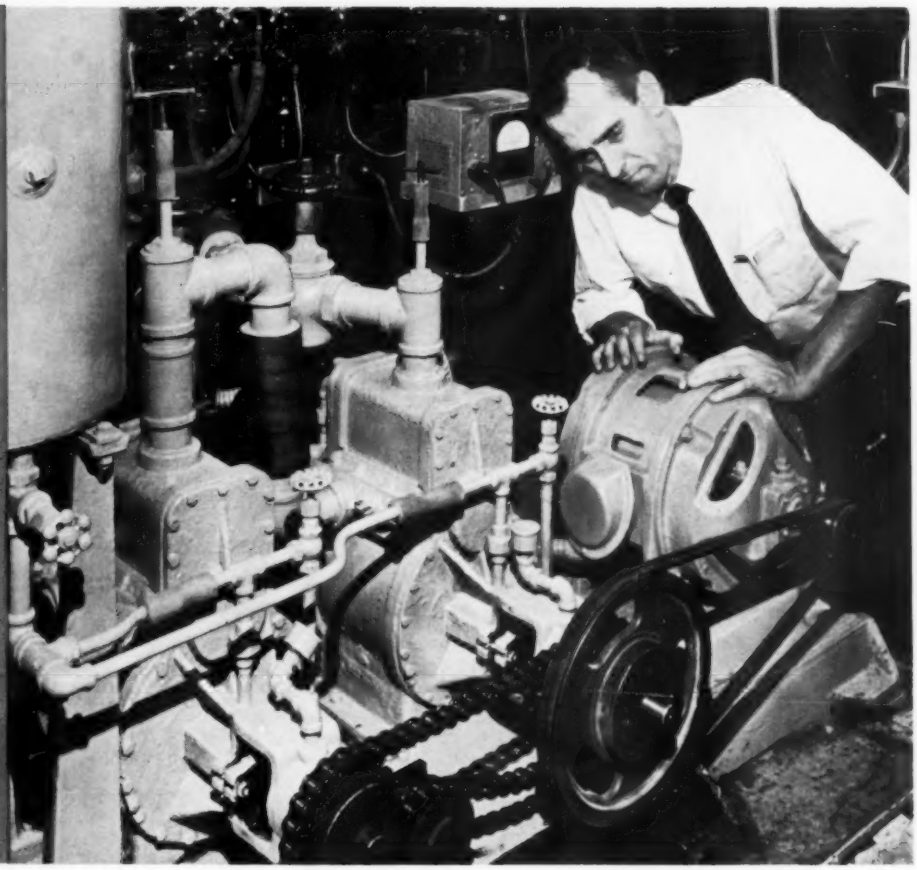
Tol-O-Matic, Inc. 62
Tormag Products Div.,
Gleason-Reeel Corp. 58
Triangle Mfg. Co. 56

United Motors Service Div.,
General Motors Corp. 49
U.S. Electrical Motors ..... Cover II

Warner Electric Brake & Clutch Co. ..30
Winsmith, Inc. 29
Worthington Corp. ..... 34 & 35

Exclusive design features include: precisely engineered arched top, concave sidewalls, Flex-Weave cover, super strength tensile construction.

Super HC Drives for 45 vacuum pumps on lamp production units at the Westinghouse Trenton, N. J. plant are saving over $1,000 a year in belt replacement costs.



Westinghouse converts drives on 45 machines to new Gates Super HC High Capacity V-Belts

When drive space is limited, a driver sheave too small in diameter is sometimes used—though not recommended. Constant flexing over a small sheave is severe punishment for V-belts. Because of this, conventional V-belts lasted 4 months or less on the vacuum pumps on lamp production units at the Westinghouse Lamp Division plant in Trenton, N.J.

Now, with space-saving Gates Super HC High Capacity V-Belt Drives on all 45 machines, all belts are still running strong after more than 1½ years . . . a saving of over $1,000 in belt replacement costs plus even greater savings through reduced down-time.

The Gates Super High Capacity V-Belt is a new concept in V-belt design.

It is industry's first and most advanced high capacity V-belt. Because of exclusive design features, Gates Super High Capacity V-Belts transmit up to 3 times more horsepower than conventional V-belts in the same space. Or the same power can be handled with fewer belts and smaller sheaves in less space.

As a result, Gates Super HC Drives save up to 50% in drive space . . . cut your drive costs as much as 20% . . . reduce drive weight 20% and more . . . and make possible further savings in material costs.

Your local Gates Field Engineer is an experienced, fully-qualified drive design expert. Contact him for Super HC design information and for design help.

Building the future on 50 years of progress

The Gates Rubber Company, Denver, Colorado BP40

Gates Super HC V-Belt Drives

Circle **18** on Reader Service Card

You should be growing right out of your job

Your specialized business magazine is the vitamin supplement it takes to keep your career growth moving right along. Vitamins alone won't carry you very far: they simply help you use basic career-building nutrients—hard work is a popular one—more effectively. But the man who works smarter and harder than the next fellow has a pretty good combination going for himself.

You will find in each issue of POWER TRANSMISSION DESIGN a balanced combination of the information supplements your progress needs: it is written by specialists to solve your problems in both original equipment and in-plant design and maintenance.

This hard-working editorial package will give you ideas you can put to work on your job. They will help you become more valuable to your company and to yourself. Check the contents page now for ideas you can use. And for more facts on any item described or advertised in this issue, use the handy Reader Service Cards.

Franchise Circulation gets magazines to the men who buy

Distilled Writing gets magazines read

Published by Power Publishing Company, Inc., a subsidiary of The Industrial Publishing Corporation

POWER TRANSMISSION DESIGN

THE MAGAZINE OF MACHINE DRIVES

812 HURON ROAD • CLEVELAND 15, OHIO • SUPERIOR 1-9620

OFFICES: NEW YORK • CHICAGO • LOS ANGELES • LONDON